PS-T20

Canadian Model
AEP Model
UK Model
E Model

STEREO TURNTABLE SYSTEM

SPECIFICATIONS

GENERAL

Power Requirements:	120, 220 V ac adjustable, 50/60 Hz (AEP, E model) 240 V ac, 50 Hz (UK model) 120 V ac, 60 Hz (Canadian model)
Power Consumption:	8W (AEP, UK, E model) 6W (Canadian model)
Dimensions:	Approx. 445 (w) x 140 (h) x 375 (d) mm 17½ (w) x 5½ (h) x 14¾ (d) inches including projecting parts and controls
Weight:	Approx. 5.5 kg, 12 lb 2 oz (net) 6.5 kg, 14 lb 6 oz (in shipping carton) (AEP, E, UK model) 6.6 kg, 14 lb 10 oz (in shipping carton) (Canadian model)

TURNTABLE

Platter:	31.3 cm, 12 3/8 inches, aluminum-alloy diecast
Motor:	Linear BSL motor (brushless and slotless)
Drive System:	Direct drive, Magnedisc servo control
Speeds:	33 1/3, 45 rpm
Pitch Control Range:	±4%
Wow and Flutter:	±0.065% (DIN) 0.04% (WRMS)
S/N Ratio:	68 dB (DIN-B)
Automatic System:	Lead-in, return, reject, repeat

TONEARM

Type:	Statically balanced, universal
Pivot-to-stylus Length:	216.5 mm, 8½ inches
Overall Arm Length:	300 mm, 11 7/8 inches
Overhang:	16.5 mm, 21/32 inches
Tracking Error:	+3°, –1°
Tracking Force Adjustment Range:	0—3 g
Shell Weight:	7.5 g
Cartridge Weight Range:	4—10 g

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY SHADING AND MARK ⚠ ON THE SCHEMATIC DIAGRAMS, EXPLODED VIEWS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY.

ATTENTION AU COMPOSANT AYANT RAPPORT À LA SÉCURITÉ !

LES COMPOSANTS IDENTIFIÉS PAR UN TRAMÉ ET UNE MARQUE ⚠ SUR LES DIAGRAMMES SCHÉMATIQUES, LES VUES EXPLOSÉES ET LA LISTE DES PIÈCES SONT CRITIQUES POUR LA SÉCURITÉ DE FONCTIONNEMENT. NE REMPLACER CES COMPOSANTS QUE PAR DES PIÈCES SONY DONT LES NUMÉROS SONT DONNÉS DANS CE MANUEL OU DES SUPPLÉMENTS PUBLIÉS PAR SONY.

SONY®

SERVICE MANUAL

MODEL IDENTIFICATION

– Specification Label –

AEP, E model

SONY®

STEREO TURNTABLE SYSTEM
MODEL NO,PS-T20
~120, 220V 50/60Hz 8W

SERIAL NO.
MADE IN JAPAN

Canadian model

SONY®

STEREO TURNTABLE SYSTEM
MODEL NO,PS-T20
AC 120V 60Hz 6W

SERIAL NO.
MADE IN JAPAN

UK model

SONY®

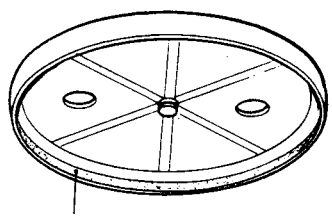
STEREO TURNTABLE SYSTEM
MODEL NO,PS-T20
~240V 50Hz 8W

SERIAL NO.
MADE IN JAPAN

REPAIR CAUTION

1. Turntable handling

bottom view of turntable

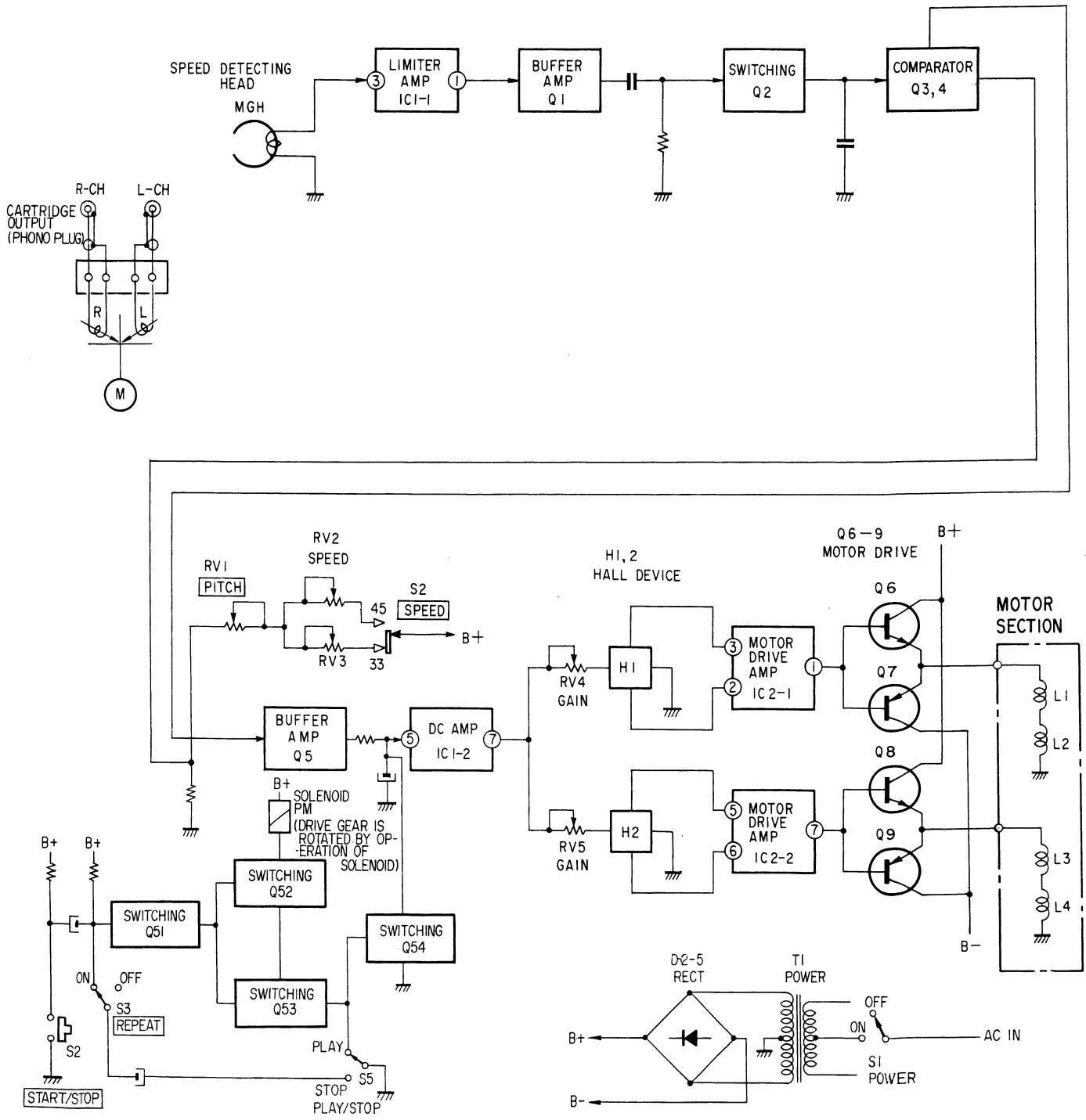


Be sure not to spoil the magnetic coating. (dark brown color)

2. Perform the adjustments and checks after the circuit becomes stable. (Wait several seconds after switching on the power.)

SECTION 1
OUTLINE

1-1. BLOCK DIAGRAM



1-2. CIRCUIT DESCRIPTION (See Fig. 1-5)

Motor Servo System is explained in Block Diagram Fig. 1-1.

Apply the voltage Vi to the motor coil to rotate at a given speed ω, soon the motor reaches the speed ω.

When any changes occur in the rotational speed, a detector reads the amount of the error and the feedback circuit produces the voltage Vf required to correct the speed, returning Vf to the input.

Servo System works to keep the speed constant by adding or subtracting a voltage change Vf of the output to the input Vi.

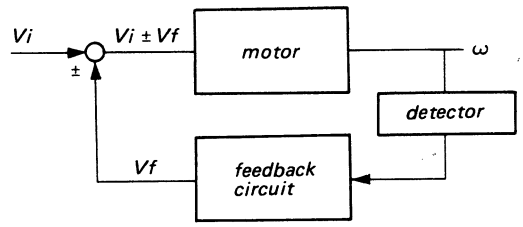


Fig. 1-1

The servo motor employs the frequency generator (FG) as a detector and the feedback circuit as shown in Fig. 1-2.

The signal voltage generated in FG is fed to the limiter amplifier to eliminate the voltage fluctuation, and in the next stage of the frequency discriminator the variation of the frequency is converted into the voltage proportioned to the rotational speed.

This voltage is rectified, amplified by DC amplifier and supplied to the motor.

The reference frequencies detected by the multi-gap head (MGH) are 284 Hz at 33 rpm and 384 Hz at 45 rpm.

Limiter IC1-1

1. Once the turntable starts to rotate, an output signal is produced by the MG head.
2. Although the MG head output signal is a sine wave, there is some fluctuation in amplitude. Therefore, above a certain level, this sine wave is changed into a constant-amplitude square wave.

Q1

Q1 amplifies the output signal from IC1-1 and converts it into a square wave by clipping.

Differential Circuit C2, R4

The square wave signal on the collector of Q1 is changed to a triangular wave by C2 and R4. The differentiated (triangular) pulse triggers the sawtooth wave generator transistor (Q2).

Sawtooth Wave Generator Circuit Q2, C3

While Q2 is turned off, C3 is charged up through R5. When the positive trigger pulse is applied to the base of Q2, Q2 turns on and then C3 discharges instantly through Q2.

After discharging, C3 is recharged, resulting in the Q3 base forming a sawtooth wave signal.

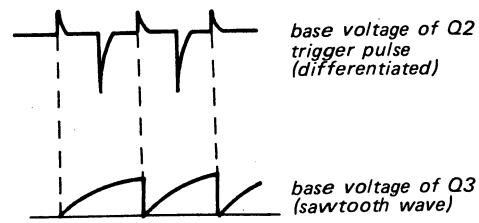


Fig. 1-3

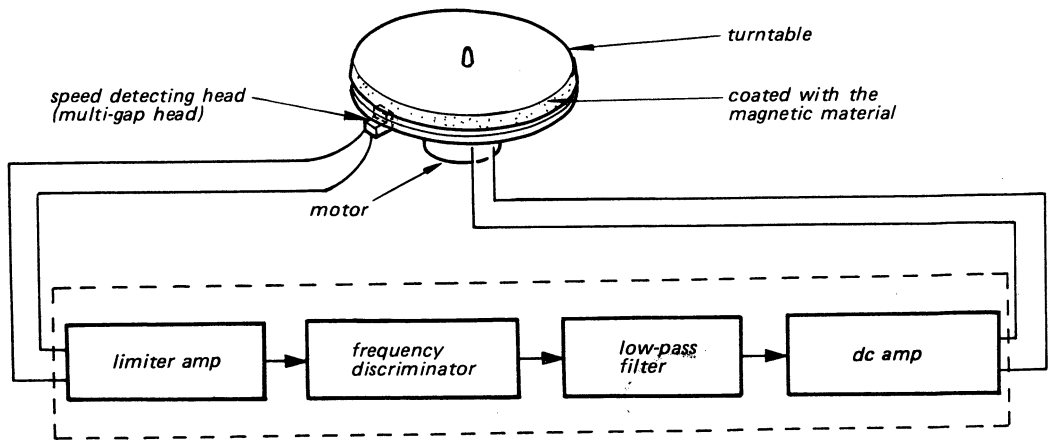


Fig. 1-2

Comparator Q3, Q4

The sawtooth wave signal is applied to the comparator circuit formed by Q3 and Q4.

The base of Q4 is biased by the bleeder resistors RV2, R9, RV1 (RV3, R10, RV1) and R8. Since, the emitter voltage of Q3 is determined by the reference voltage, Q3 will turn on when its base voltage (sawtooth wave) exceeds the total voltage (emitter voltage plus V_{BE}).

Then, a negative pulse will appear on the collector of Q3. Consequently, if the rotational speed slows down, the frequency of the sawtooth wave will be low.

When the output negative pulse width increases, the period of the time, Q3 turns on, becomes long.

Phase Converter Q5

Q5 serves as a phase converter which feeds the positive pulse signal to the next stage.

Integrator (Low-pass Filter)

The low-pass filter (composed of R12, R13, R14, C4, C5 and C6) serves as an integrator which converts the pulse signal into dc voltage in proportion to the pulse width.

IC1-2

IC1-2 is also the low-pass filter and amplifies dc voltage.

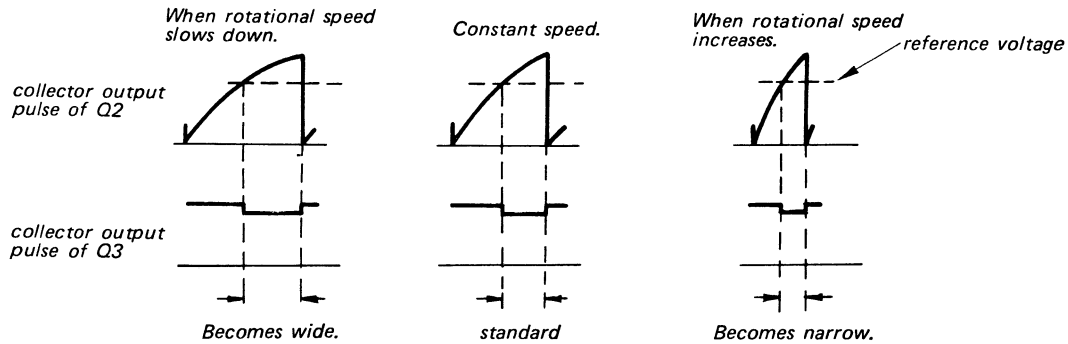


Fig. 1-4

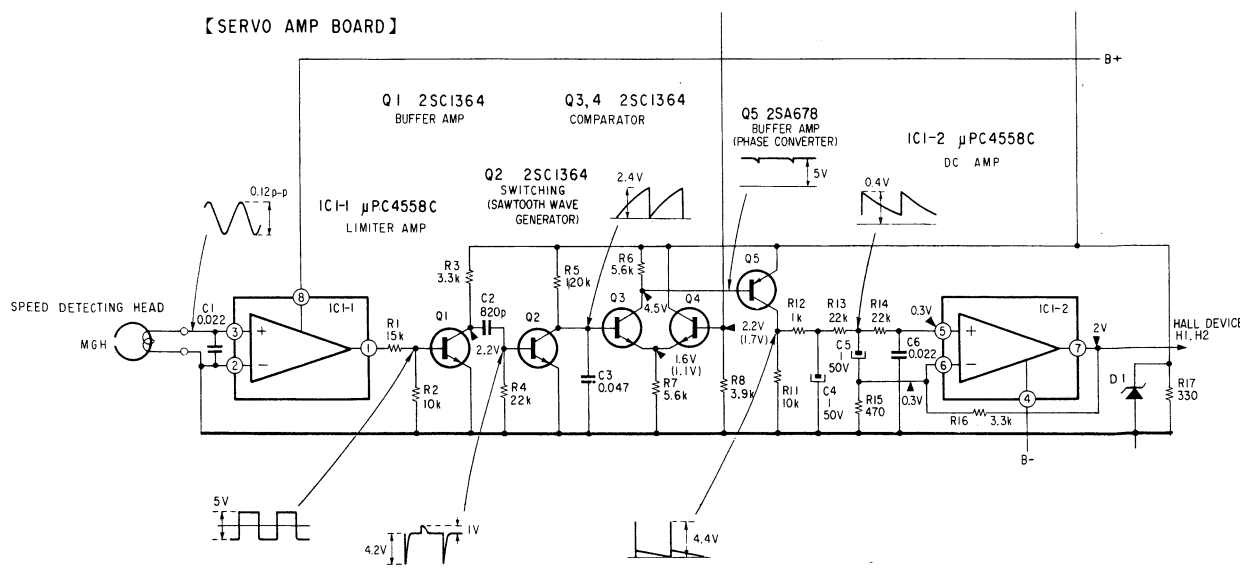


Fig. 1-5

SPEED Control

1. The selection of the speed 33/45 rpm can be done by turning the switch S2 which selects the value of the bleeder resistor connected to the Q4 base.
2. Since the base voltage of Q4 at 33 rpm is designed higher than the one at 45 rpm, the emitter voltage of Q4 at 33 rpm is higher than the one at 45 rpm.
3. When the switch S2 is changed to the speed 45 rpm from 33 rpm, the pulse width on the collector of Q3 becomes wide as illustrated in Fig. 1-6.
   Therefore, DC voltage obtained through the low-pass filter rises and the motor speed is increased.
   Finally, the motor reaches the speed of 45 rpm and keeps the constant speed of 45 rpm.

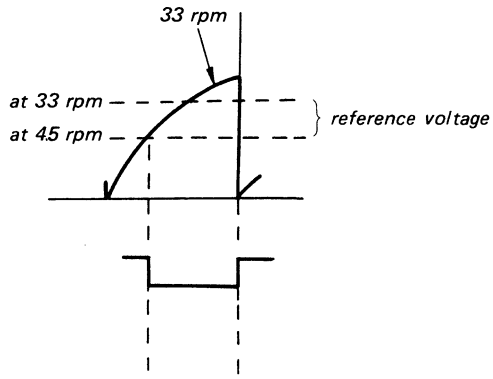


Fig. 1-6

Servo System

Any changes in the rotational speed of the motor can be corrected in the servo circuit and the motor speed is kept constant.

The servo system works as follows.

1. When the speed of the motor slows down, the frequency of the signal generated by the speed detecting head (multi-gap head) becomes low and the pulse width obtained from the comparator becomes wide.
2. Consequently, dc voltage through the low-pass filter increases, the motor speed increases and reaches the given speed.

Hall Motor

The PS-T20 is equipped with the newly developed BSL (brush and slotless) dc servo motor, which has the following major advantages.—

- Extremely uniform torque.
- All-electronic switching (no mechanical contacts used at all), resulting in very little noise.
- Extremely stable performance, and long operational life.

1. Hall Element
   The magnetic field strength is converted into electrical signals by employing the Hall Effect.

   Hall Effect: When a metal strip is placed with its plane perpendicular to a magnetic field and an electric current flows longitudinally through the strip, a potential difference is developed across the strip at right angles to the current flow and to the magnetic field.
   The potential is proportional to amounts of the current and a strength of the magnetic field.

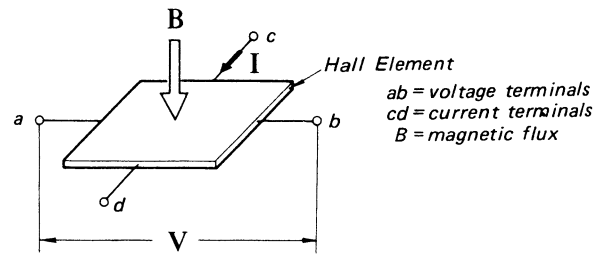


Fig. 1-7

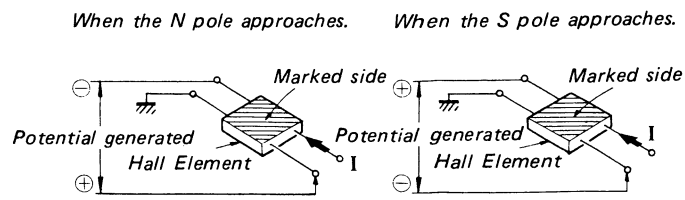


Fig. 1-8

2. Exploded View

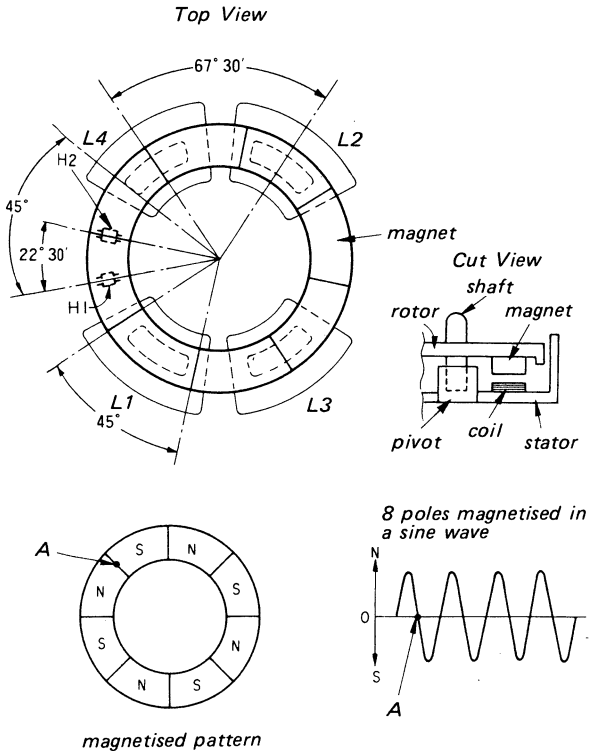


Fig. 1-9

a. The motor coils L1 and L2 (L3 and L4) form a pair, in series.
b. In order to change the phase of two signals by 90°, Hall elements H1 and H2 are positioned 22°30′ apart.
c. In order to change the phase of two signals fed to L1 and L3 (L2 and L4) by 90°, coils are positioned at 67°30′ apart.
d. The center angle of the coil is 45° so that the coil can face the magnets of which 8 poles are positioned every 45° apart.
e. The angle between the Hall element and the coil is 45° so that the flux peak of the coil comes to the flux peak of the magnet.

3. Generation of Rotational Force

According to the Fleming's left-hand rule, the force generated in the motor coil is in the counterclockwise direction, but since the coils are fixed so that the magnet (rotor) rotates clockwise.

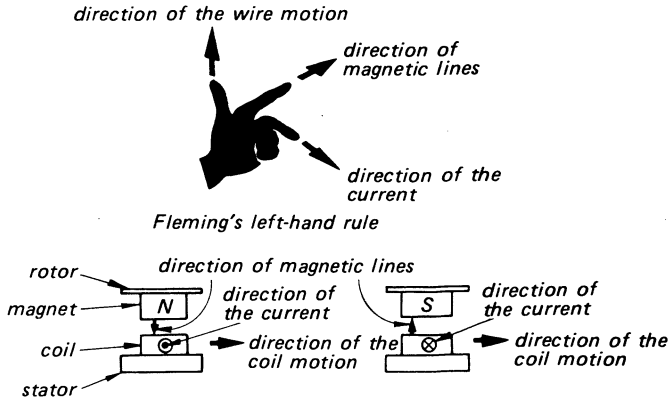


Fig. 1-10

When the Hall element H2 faces the N pole of the magnet, H2 generates voltage. The voltage is amplified by IC2-2 and fed to Q8, which also amplifies and supplies the current in L3 and L4. The coils (L3 and L4) produce the magnetic field that creates the rotational force of the rotor.

When the Hall element H1 faces the N pole, the current flows in L1 and L2, and the rotor rotates in the direction shown by the arrow.

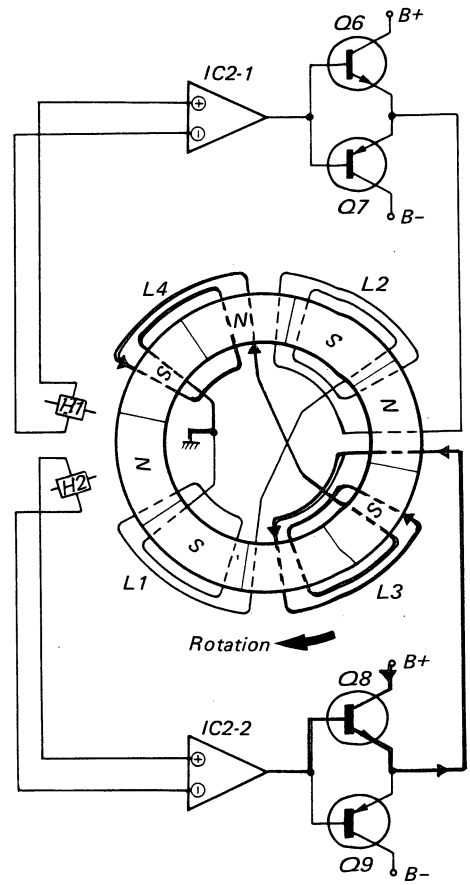


Fig. 1-11

Likewise, when the Hall element H2 faces the S pole, the current flows in L3 and L4. The rotor rotates in the direction shown by the arrow.

When the Hall element H1 faces the S pole, the current flows in L1 and L2, and the rotor is also forced to rotate in the same direction.

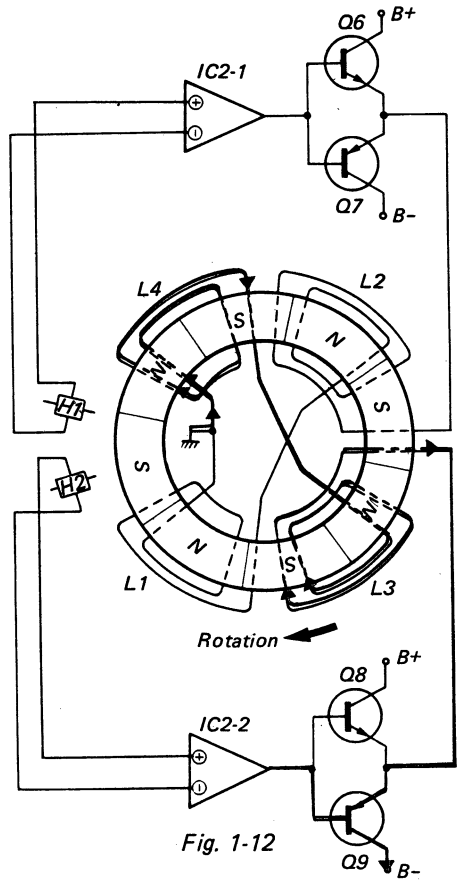


Fig. 1-12

Hence, N and S poles are repeatedly positioned oppositely to the Hall elements H1 and H2 every 22°30′ of a rotation thereby generating the voltages in these elements, resulting in the production of a current in the motor coils, and subsequent rotation of the motor.

The phase relationship between coils L1, L2 and L3, L4 are as follows:

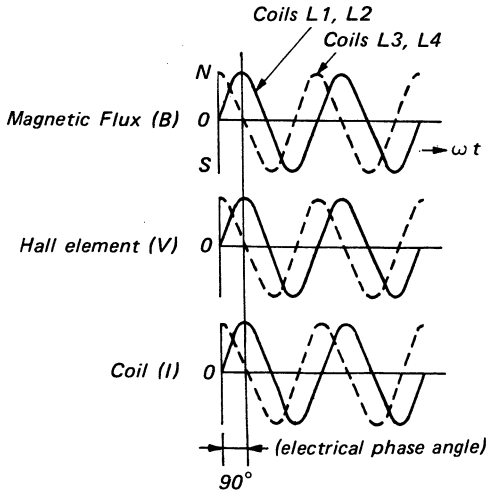


Fig. 1-13

4. Torque

A motor torque is proportional to a strength of magnetic flux (B) and amounts of current which flows in coils.

Therefore, $F = B\,I$

When the rotor which is magnetised in a sine wave pattern rotates, the Hall elements detect the variation of the magnetic flux ($B_1 = B_0 \sin \omega t$).

This controlled current ($I_1 = I_0 \sin \omega t$) is supplied to the one coil.

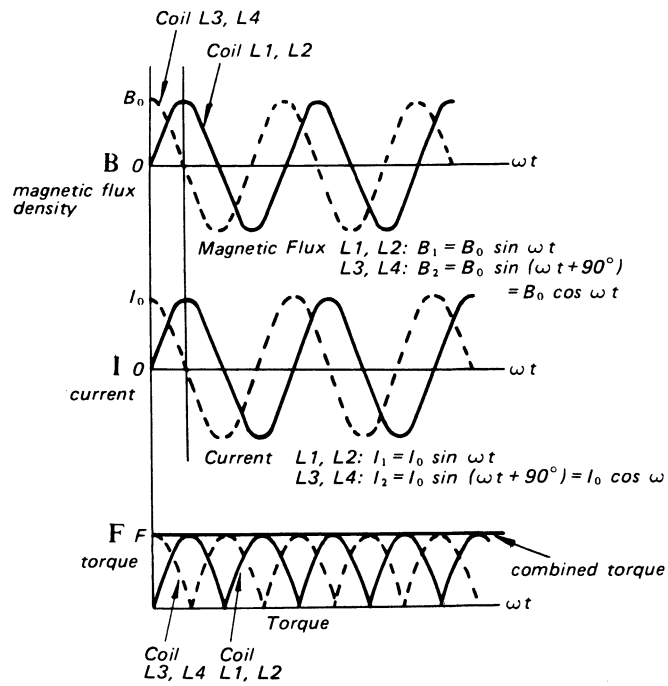
On the other hand, the current, which leads the phase angle by 90°, is supplied to the other coil.

Thus, $B_2 = B_0 \sin(\omega t + 90°) = B_0 \cos \omega t$.

$I_2 = I_0 \sin(\omega t + 90°) = I_0 \cos \omega t$.

And, when both torques ($F_1 = B_1 I_1$, $F_2 = B_2 I_2$) are produced simultaneously, their combined torque is constant as shown by the following formula.

$$F = F_1 + F_2$$
$$= B_1 I_1 + B_2 I_2$$
$$= B_0 I_0 \sin^2 \omega t + B_0 I_0 \cos^2 \omega t$$
$$= B_0 I_0 (\sin^2 \omega t + \cos^2 \omega t)$$
$$= B_0 I_0 \text{ constant}$$



Accordingly, it is said that this motor is theoretically a linear-drive motor with no torque fluctuations.

Fig. 1-14

System Control Circuit

1. START Operation (See Fig. 1-15)
   a. When the START/STOP switch (S3) is pushed, Q51, Q52 and Q53 conduct for a moment. This turns Q54 off and the solenoid (PM) on.
   b. A positive voltage is applied to the terminal (5) of IC1-2 by off state of Q54, and the turntable starts rotating.
   c. The teeth on turntable boss is engaged with the pawl of drive gear by means of the solenoid (PM), and the drive gear starts rotating. (The tonearm moves toward the lead-in groove of the record.)
   d. The PLAY/STOP switch (S5) is mechanically pushed when the drive gear rotates, and Q54 does not conduct while the tonearm is left from its rest. Accordingly, the turntable keeps on rotating.

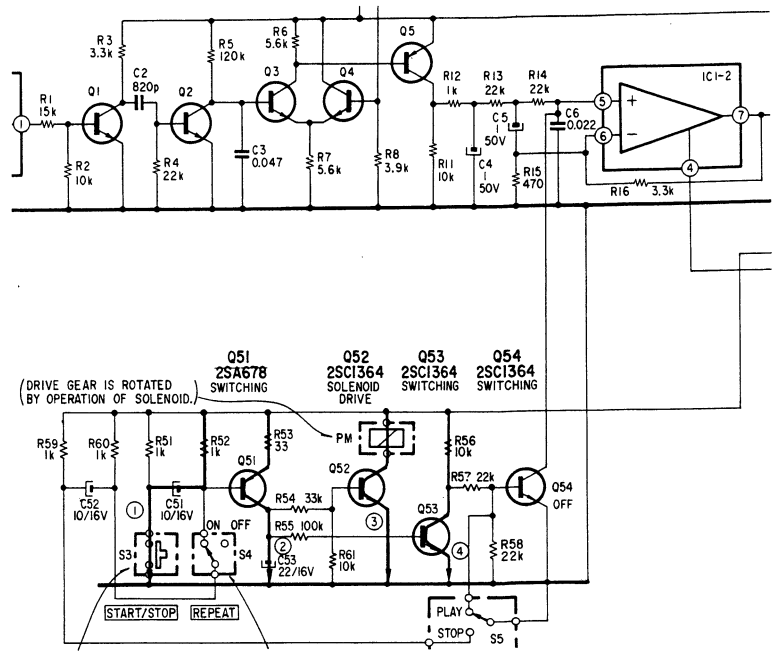


Fig. 1-15

2. STOP Operation (See Fig. 1-16)
   a. When the START/STOP switch (S3) is pushed during play, Q51 and Q52 conduct for a moment. This activates the solenoid (PM).
   b. The teeth on turntable boss is engaged with the pawl of drive gear by means of the solenoid, and the drive gear rotates half a turn. (The tonearm returns to its rest.)
   c. When the drive gear stops rotating, the PLAY/STOP switch (S5) mechanically returns to the original position, and Q54 conducts.
   d. The terminal (5) of IC1-2 is grounded via Q54 and the turntable stops rotating.

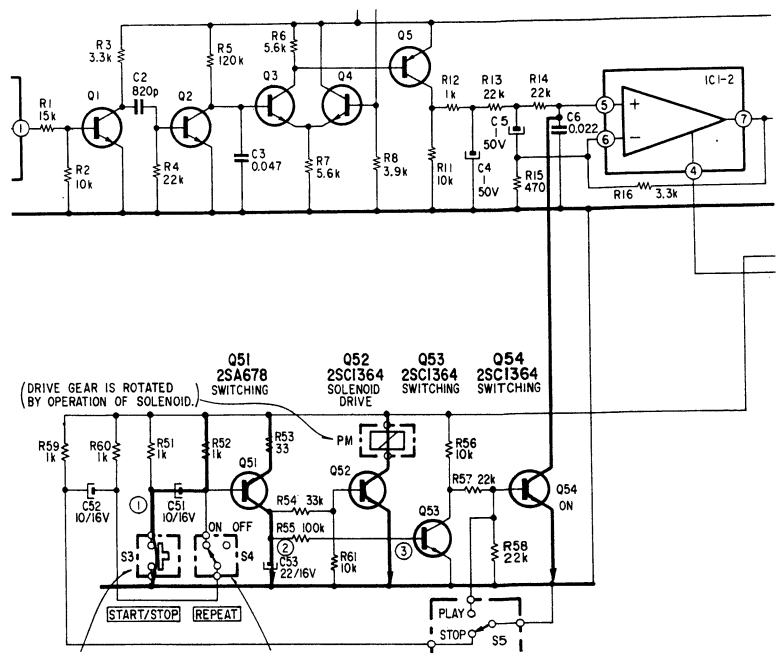


Fig. 1-16

3. REPEAT Operation (See Fig. 1-17)
   a. When the tonearm enters the out-of groove of record, the drive gear rotates and the unit starts the return operation.
   b. The PLAY/STOP switch (S5) mechanically returns to the original (STOP) position when the unit ends the return operation.
   c. Q51, Q52 and Q53 conduct, if the REPEAT switch (S4) is depressed. The solenoid (PM) is activated by on-state of Q52.
   d. The base voltage of Q54 is grounded through Q53 and Q54 does not conduct.
   e. A positive voltage is applied to the terminal ⑤ of IC1-2, and the turntable keeps on rotating.
   f. The teeth on turntable boss is engaged with the pawl of drive gear by the solenoid (PM), and the drive gear starts rotating. (The tonearm moves toward the lead-in groove of record.)
   g. When the drive gear rotates, the PLAY/STOP switch (S5) is mechanically pushed and Q54 does not conduct while the tonearm leaves its rest.
   h. While the REPEAT switch (S4) is pushed, the unit repeats the play as described in procedures a to g.
   i. The unit stops the repeat operation when releasing the REPEAT switch (S4) again.

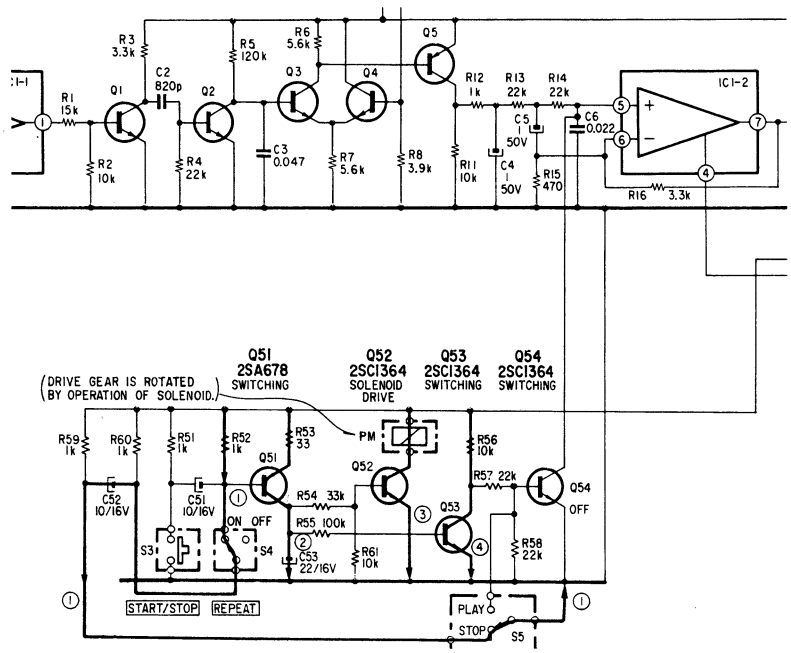


Fig. 1-17

SECTION 2
DISASSEMBLY

DUST COVER REMOVAL

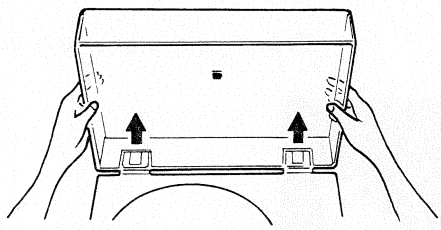


Fig. 2-1

BOTTOM BOARD REMOVAL

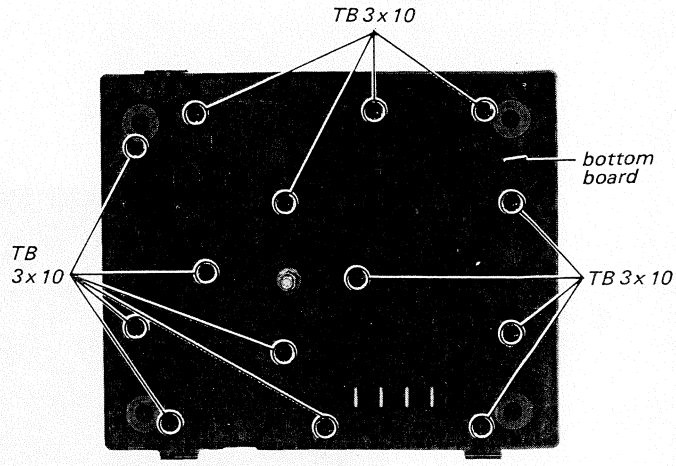


Fig. 2-4

TURNTABLE REMOVAL

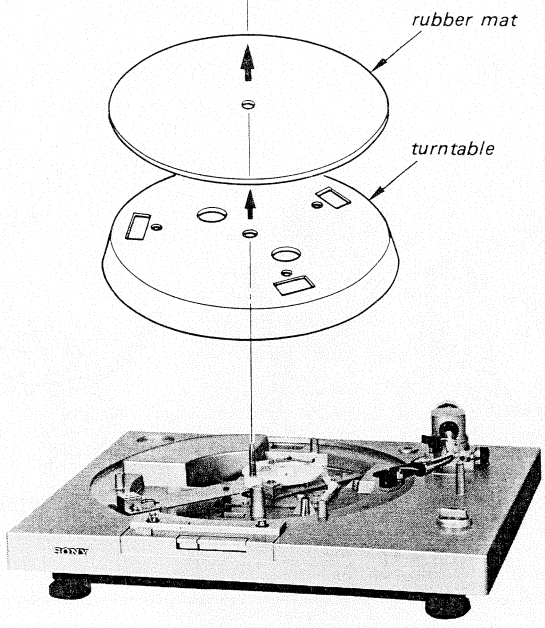


Fig. 2-2

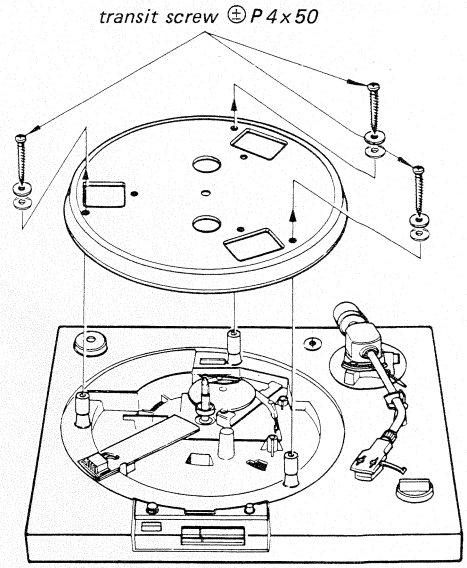


Fig. 2-3

Note: Follow the disassembly procedure in the numerical order given.

SERVO AMP BOARD AND MOTOR SECTION REMOVAL

1. Remove the screws marked ❶ in Fig. 2-5 and then perform ❷.
2. Confirm that the positions of the teeth on the turntable boss and the drive gear are the same as shown in Fig. 2-6. Then, remove the servo amp board and the motor section downward.

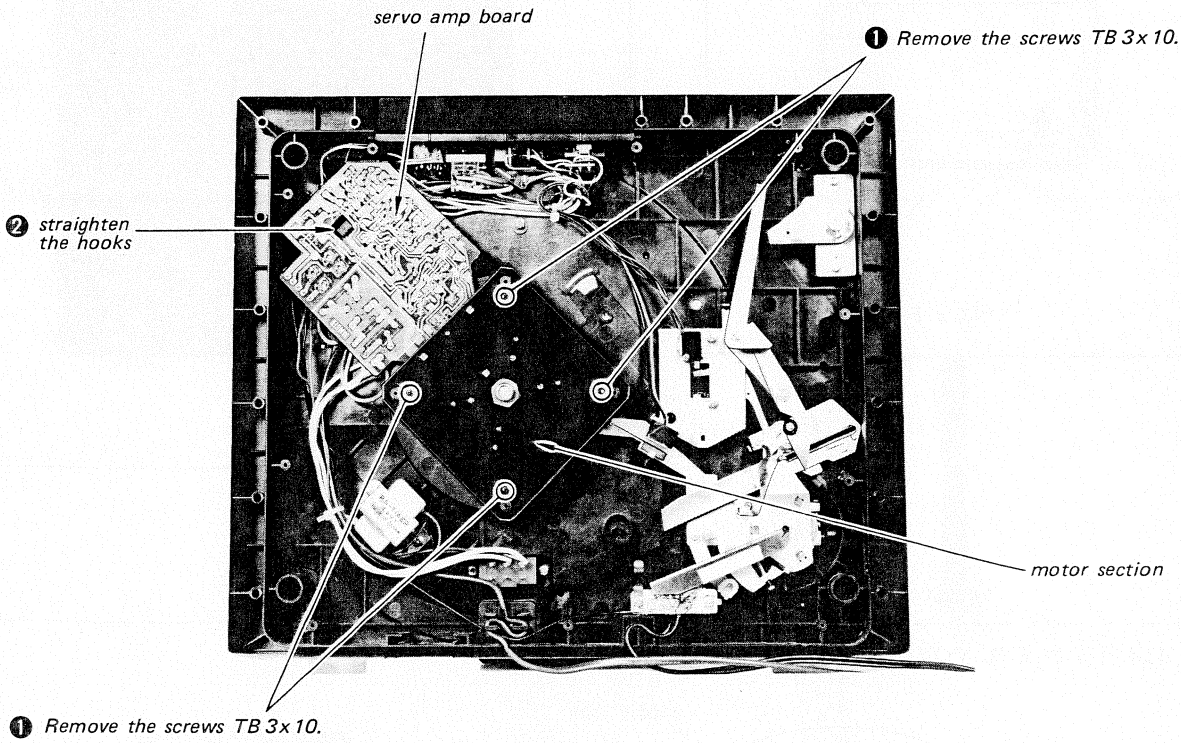


Fig. 2-5

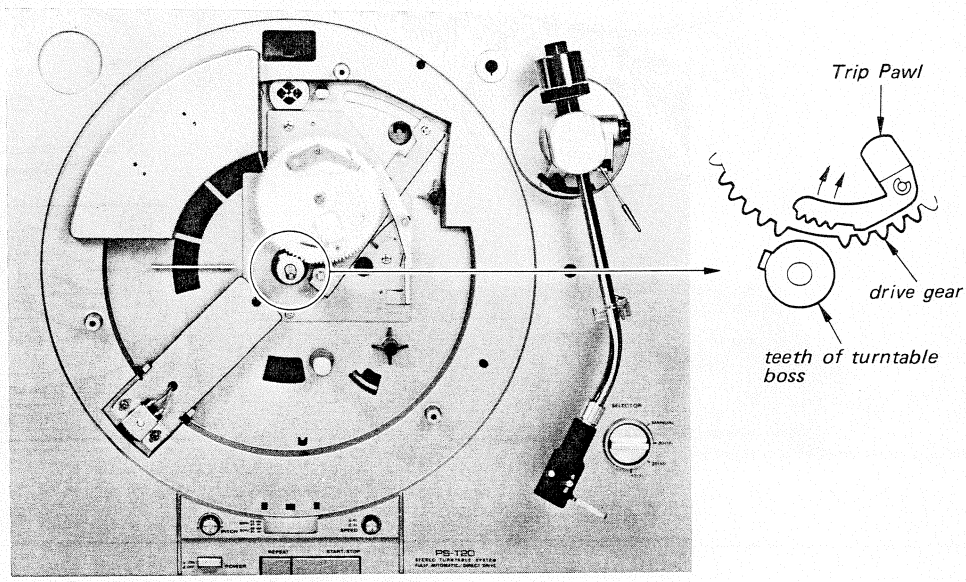


Fig. 2-6

TONEARM REMOVAL

Turn the set upside-down and remove in the numerical order.

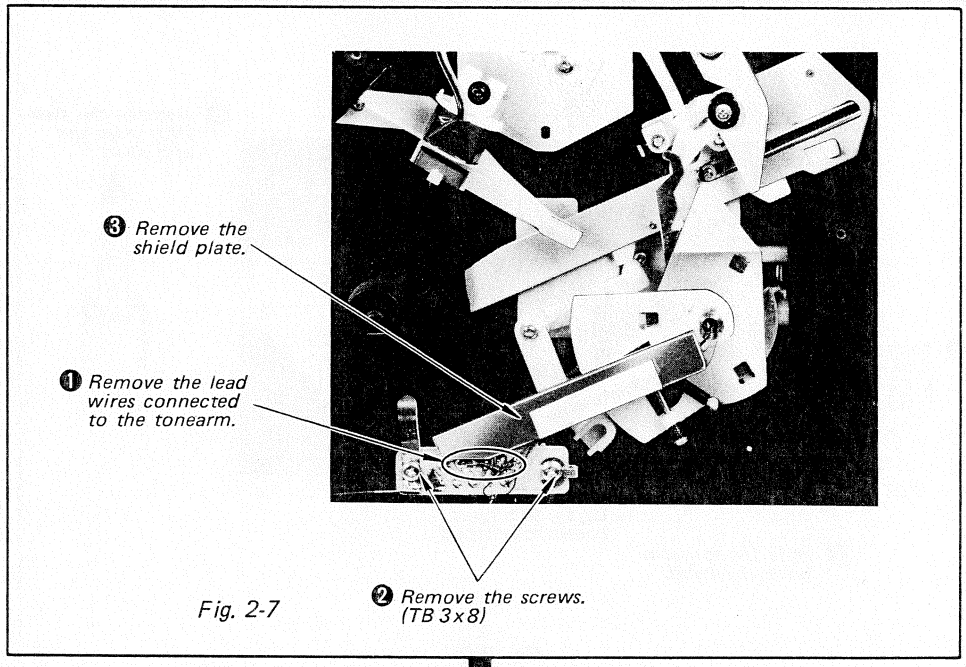


Fig. 2-7

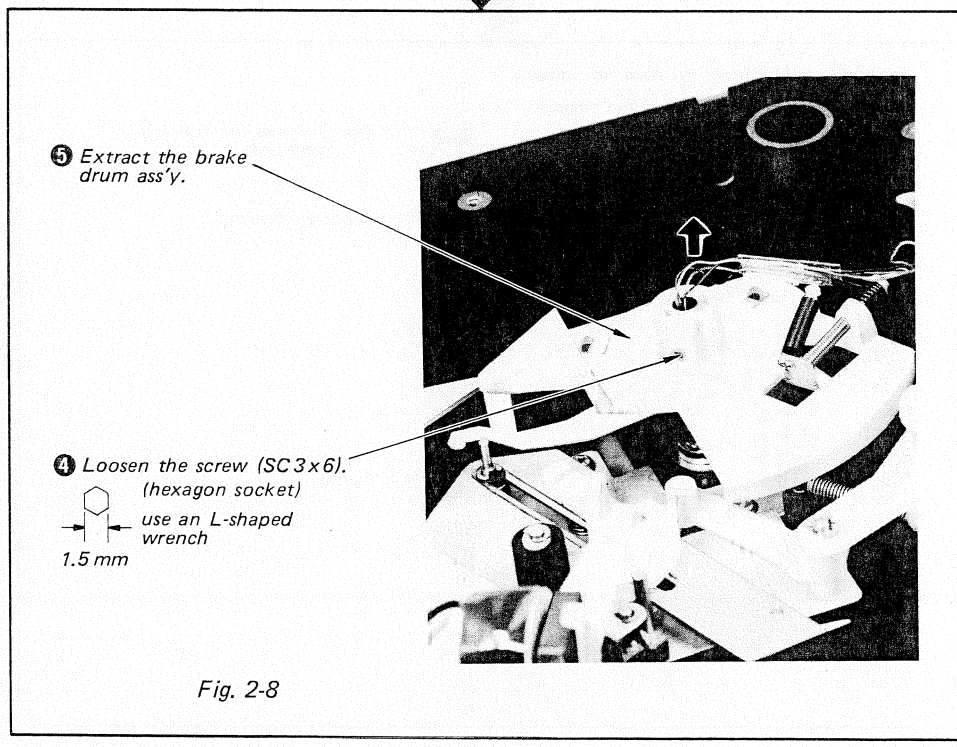


Fig. 2-8

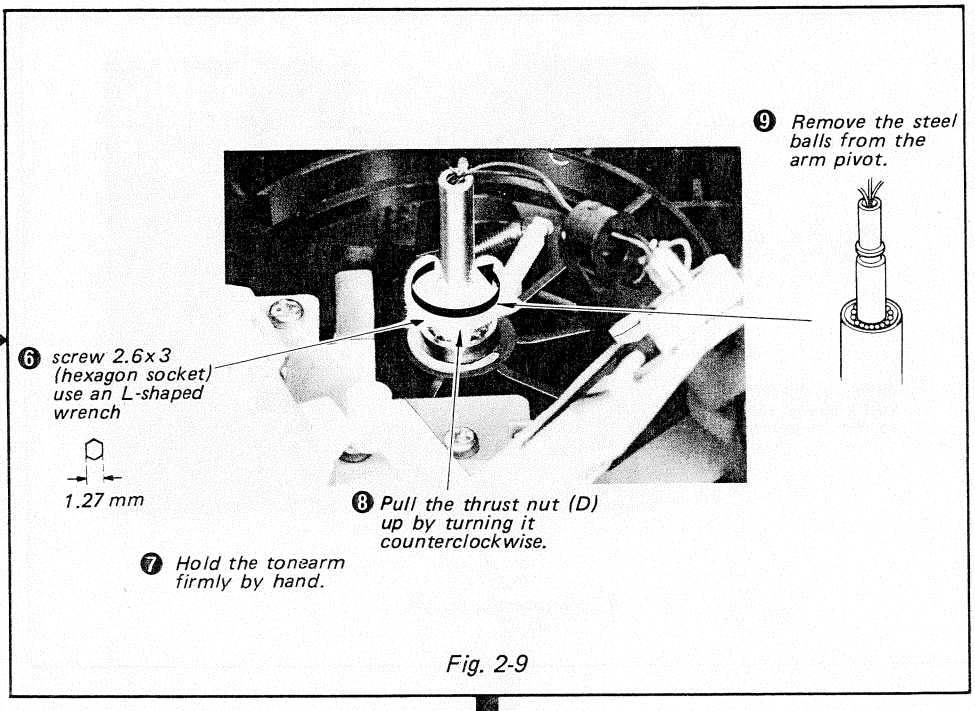

❾ Remove the steel balls from the arm pivot.
❻ screw 2.6x3 (hexagon socket) use an L-shaped wrench
1.27 mm
❽ Pull the thrust nut (D) up by turning it counterclockwise.
❼ Hold the tonearm firmly by hand.

Fig. 2-9

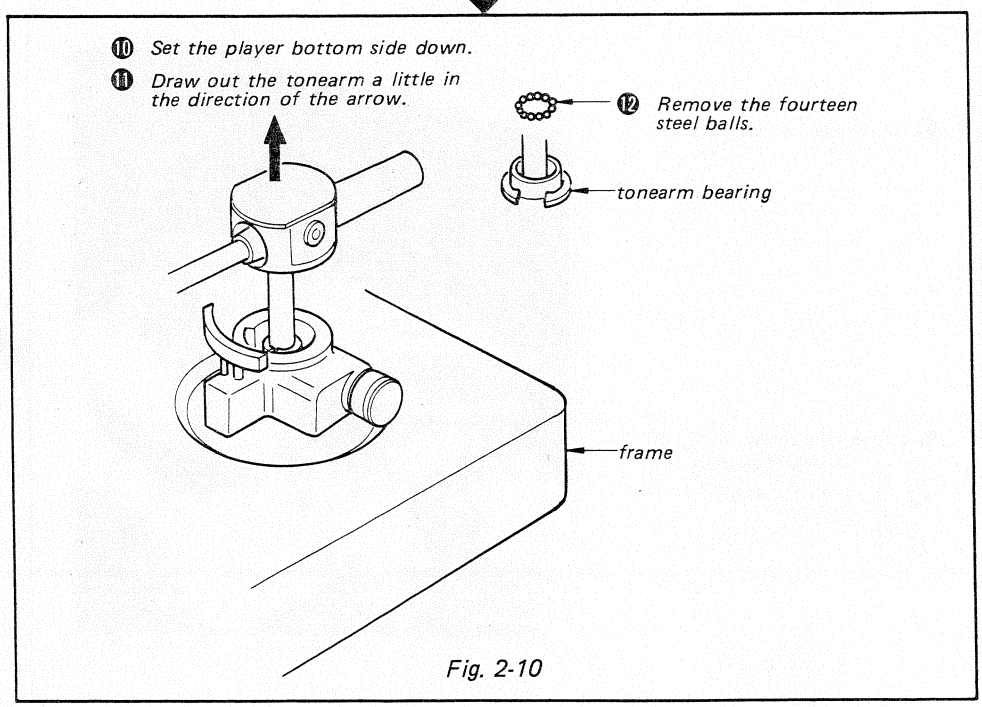

❿ Set the player bottom side down.
⓫ Draw out the tonearm a little in the direction of the arrow.
⓬ Remove the fourteen steel balls.
tonearm bearing
frame

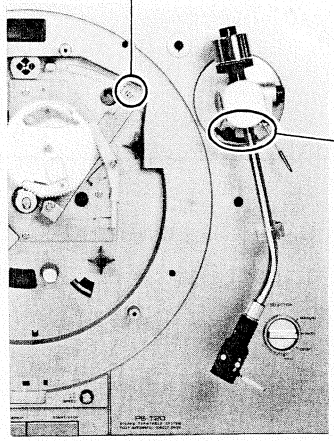
Fig. 2-10

ARM LIFTER REMOVAL

❶ *Remove the dust cover, the turntable and the bottom board.*

❸ *Remove the brake drum assembly. (Refer to "Tonearm Removal".)*

❹ *E-ring*



❷ *Remove the arm lifter assembly with an L-shaped wrench.*

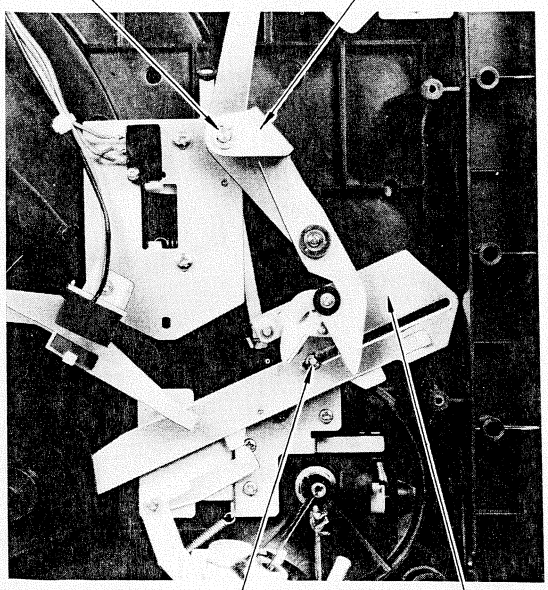
(⬡ d = 1.27 mm)

d

Fig. 2-11

❺ *Remove the E-ring (4 mm dia.) and the lead-in lever ass'y.*

lead-in lever ass'y



❻ *Remove the E-ring (2 mm dia.) and the drive gear slider ass'y.*

drive gear slider ass'y

Fig. 2-12

❼ *TB 3x6*

arm lifter ass'y

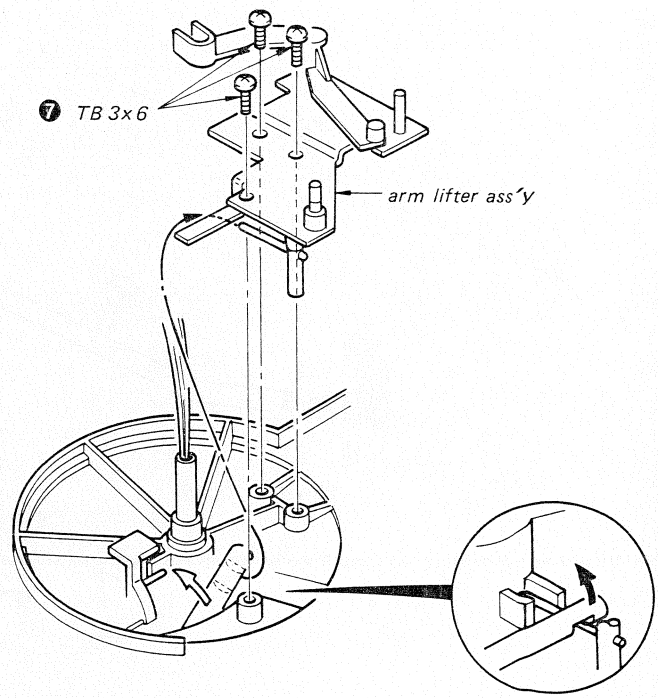


Fig. 2-13

TONEARM DISASSEMBLY

Remove four screws ❶.

Disassemble Ⓐ.

Remove two screws ❷.

Disassemble Ⓑ, Ⓒ and Ⓓ.

- Remove screw ❻. → Disassemble Ⓘ.
- Remove screw ❸. → Disassemble Ⓕ.
- Remove two screws ❹. → Disassemble Ⓗ and Ⓔ.
- Remove nut ❺. → Disassemble Ⓙ.

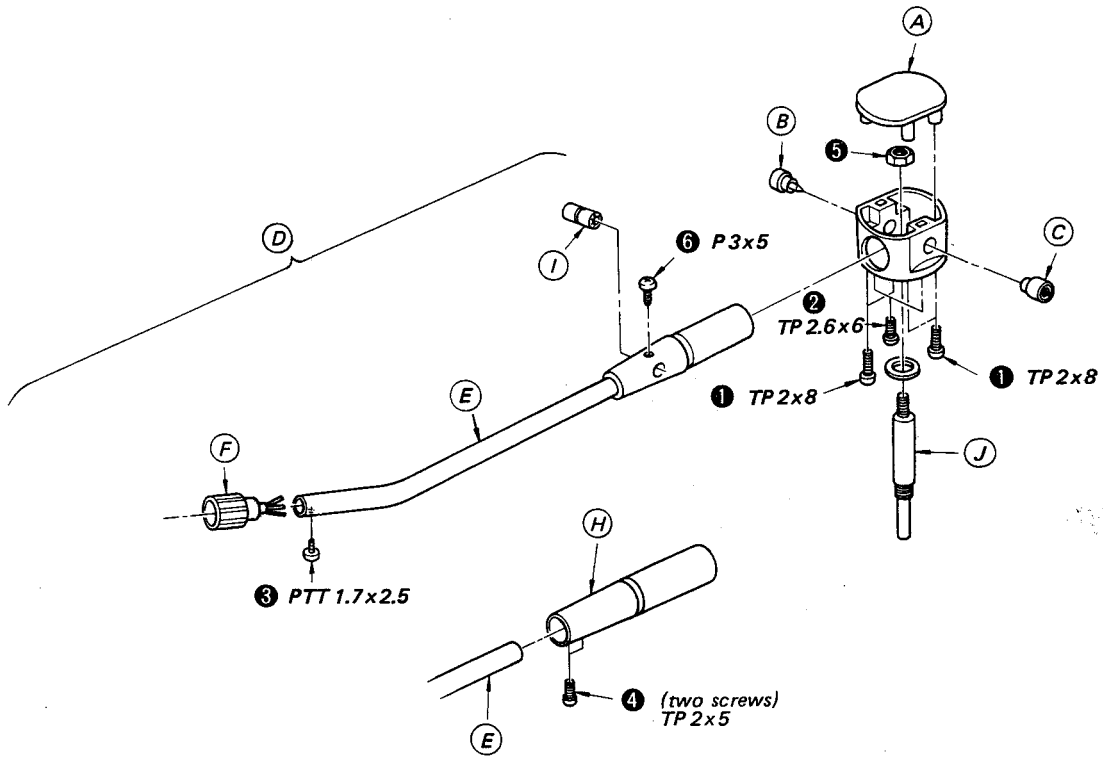


Fig. 2-14

SECTION 3
ASSEMBLY

3-1. TONEARM ASSEMBLY

1. Pipe Assembly (1)

1. Thread a wire in Ⓓ.
2. Thread the leads of Ⓖ in Ⓕ and Ⓔ, and hook the leads by the wire.
3. Insert Ⓖ in Ⓓ by pulling the wire in the direction shown by the arrow, adjust two holes marked *1, *2 and tighten the screw ③.

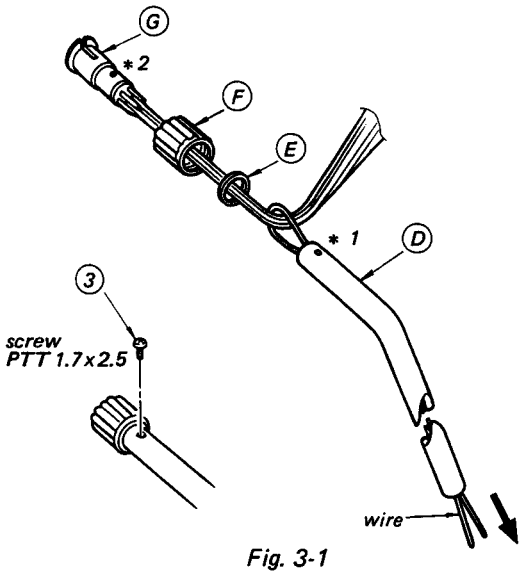


Fig. 3-1

2. Pipe Assembly (2)

1. Thread a wire in Ⓗ as shown below.
2. Hook one lead of Ⓚ and four leads of Ⓖ to the loop of wire, and pull the wire as shown.
3. Align the holes marked *1, *2, *3 to tighten the screws ④.

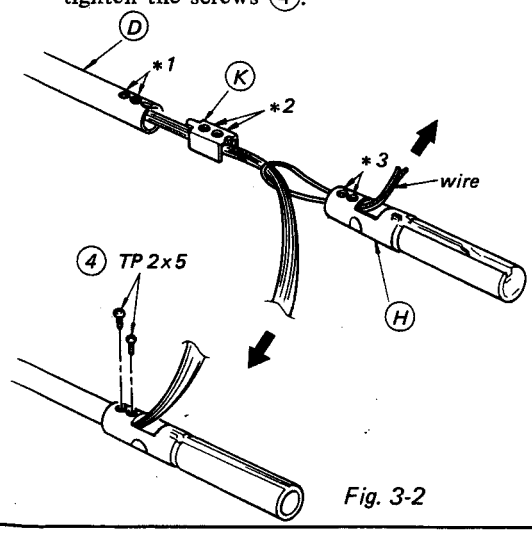


Fig. 3-2

3. Installation of Pipe Assembly

1. Thread a wire in Ⓙ.
2. Hook the five leads to the loop of wire.
3. Insert the pipe assembly into Ⓛ, while pulling the wire.

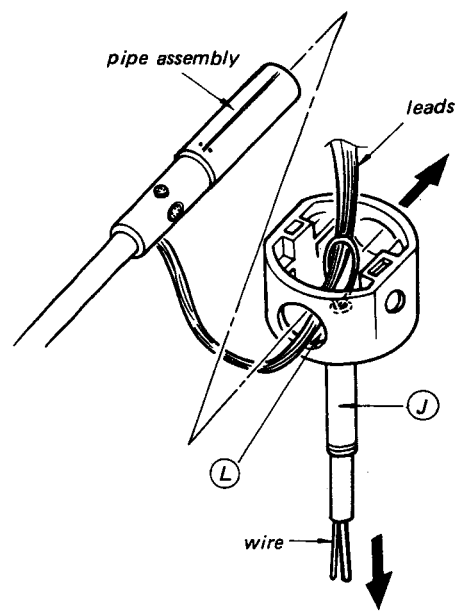


Fig. 3-3

4. Setting of Pivot (A) and Pivot (B)

Push the pivot (A) and the pivot (B) into the holes of Ⓛ strongly and tighten the screws ② .

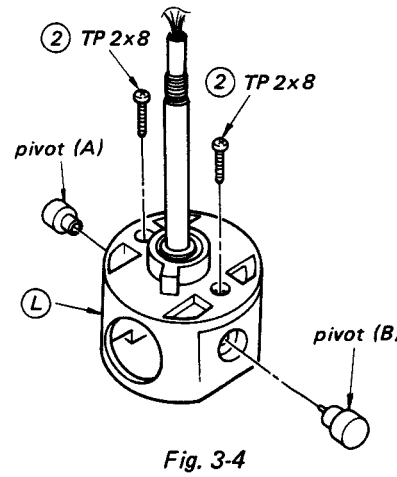


Fig. 3-4

5. Setting of Pivot Screw and Lock Nut (A)

1. Adjust the positions of the pivot (A) and the pivot bearing of the center boss to secure the screw ①.
2. Tighten the screw ① and the nut ② temporarily.

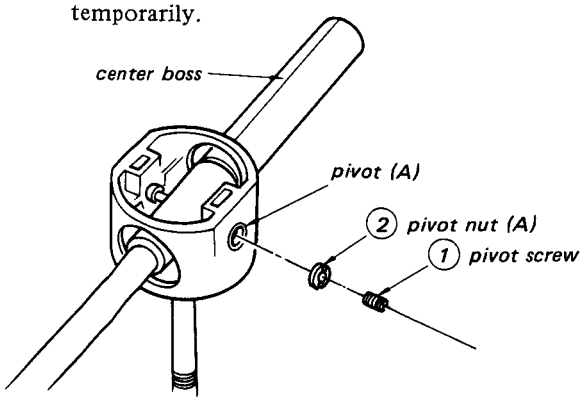


Fig. 3-5

3. Install the head shell (with a cartridge) and the counterweight to the tonearm.
4. Perform the balance adjustment with the screw and the nut, repeating the following procedures.
   a. When the 100 mg weight is placed on the top of the shell (just above a stylus), the tonearm sinks 5 mm (measured at the stylus-tip).
   b. When the weight is removed, the tonearm returns horizontally.

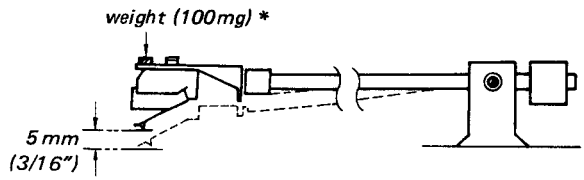


Fig. 3-6

*The 100 mg weight is avairable by cutting the designated portion from page 23.

3-2. INSTALLING TONEARM TO FRAME

1. Clean the portion of the arm pivot marked by * in Fig. 3-7 with an alcohol-moistened swab.
2. Insert the arm shaft in the arm pivot by half.
3. Put the fourteen cleaned steel-balls into the portion marked *.
4. Insert the arm shaft in the arm pivot completely.
5. Hold the tonearm firmly by hand and turn the set upside-down.

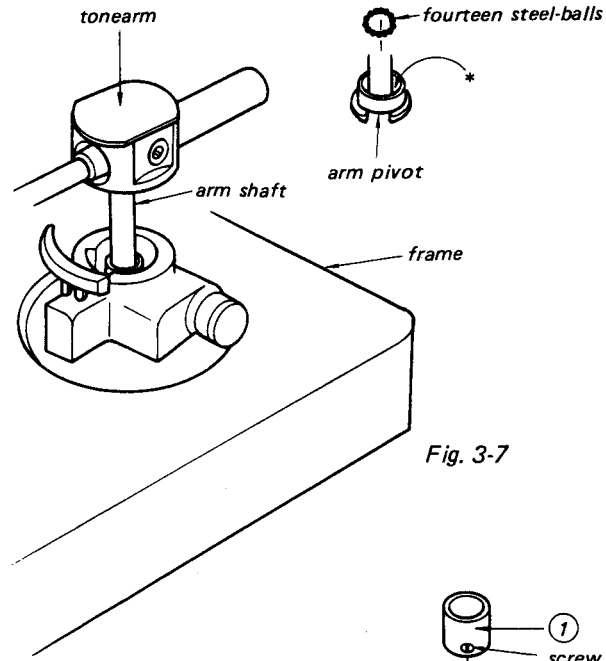


Fig. 3-7

6. Clean the portion marked * in Fig. 3-8.
7. Put the fourteen cleaned steel-balls into the portion marked by * in Fig. 3-8.

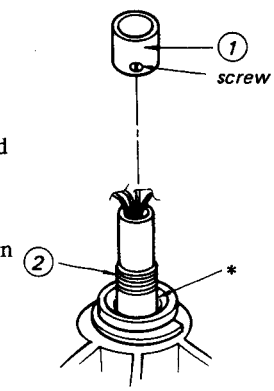


Fig. 3-8

8. Insert the ① (with a screw side down) and screw up the ① to the extent of ② being movable slightly up and down.
9. Tighten the screw with an L-shaped wrench (dia. 1.27 mm).
10. Adjust the stylus-force to 750 mg and trace the stylus on the grooveless disk.
11. Confirm that the tonearm traverses smoothly from the outer track to the inner.
12. If not, readjust the ①.

3-3. INSTALLATION OF SOLENOID MAGNET

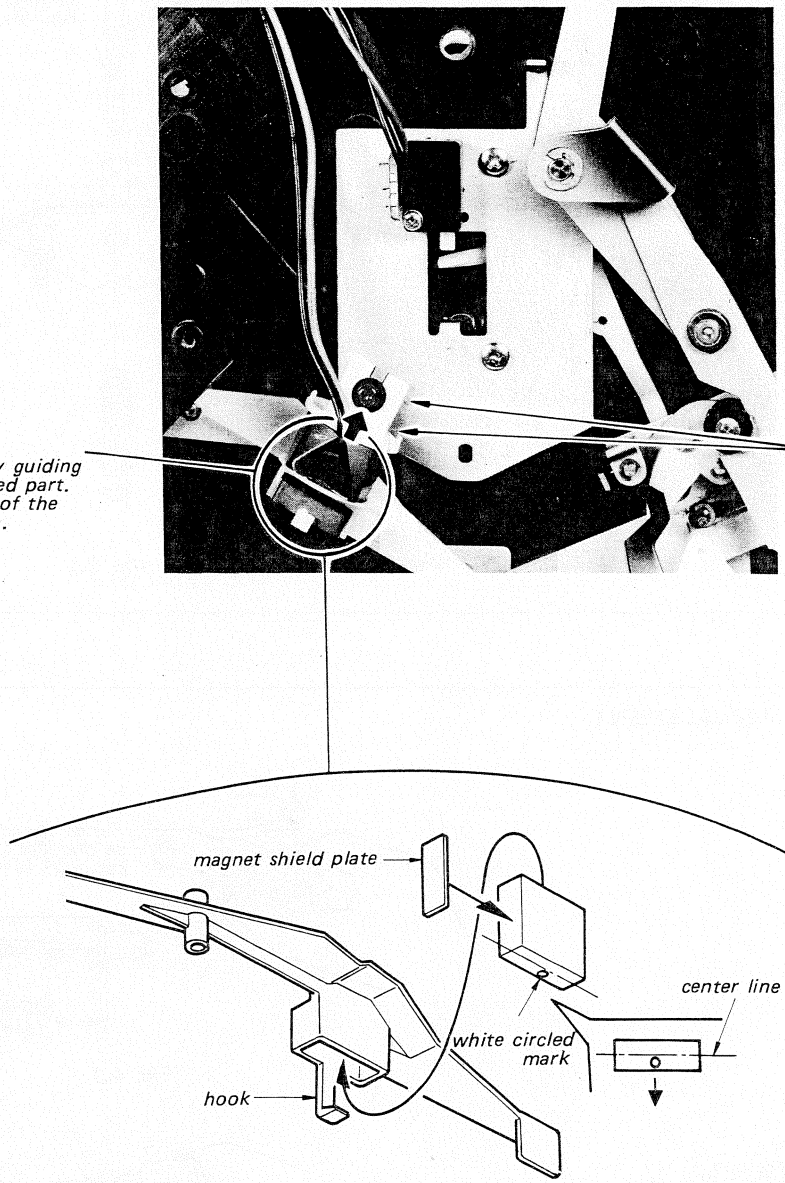

Solenoid
Install the solenoid by guiding it against the protruded part. Push in the direction of the arrow and screw it on.
Protruded part
magnet shield plate
center line
white circled mark
hook

Fig. 3-9

SECTION 4
LUBRICATION AND CARTRIDGE REPLACEMENT

4-1. LUBRICATION

Drive Gear

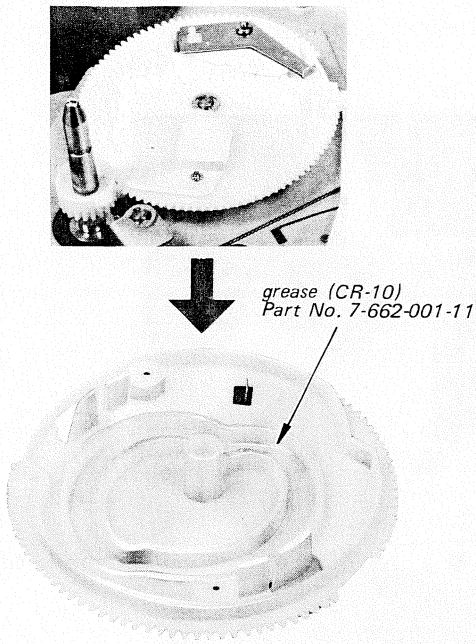


Fig. 4-1

Arm Lifter

Apply silicone-oil to the shaded portion ▨.

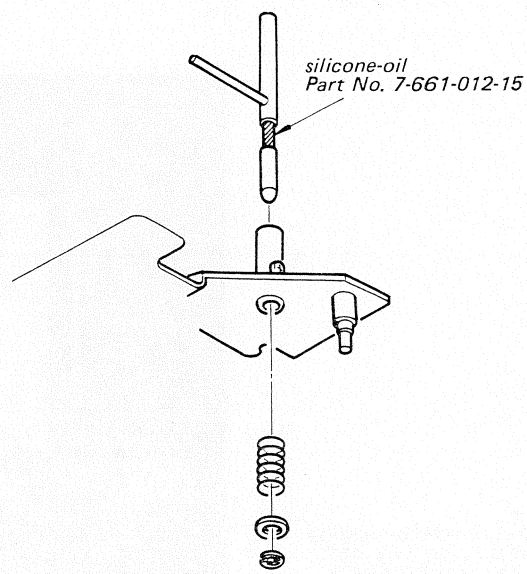


Fig. 4-2

4-2. CARTRIDGE REPLACEMENT

Position Adjustment

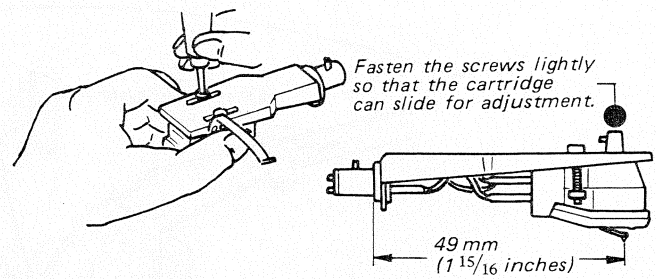


Fig. 4-3

Wiring

Wires	Cartridge pins
White	L (left channel signal)
Blue	LE or G (left channel ground)
Red	R (right channel signal)
Green	RE or G (right channel ground)

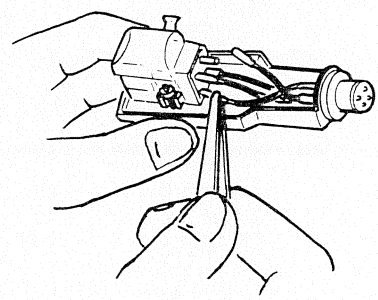


Fig. 4-4

SECTION 5
MOTOR REPAIRING

The motor and the servo amp board are assembled together. If found defective, disassemble the motor block as shown in Fig. 5-1 and repair it.

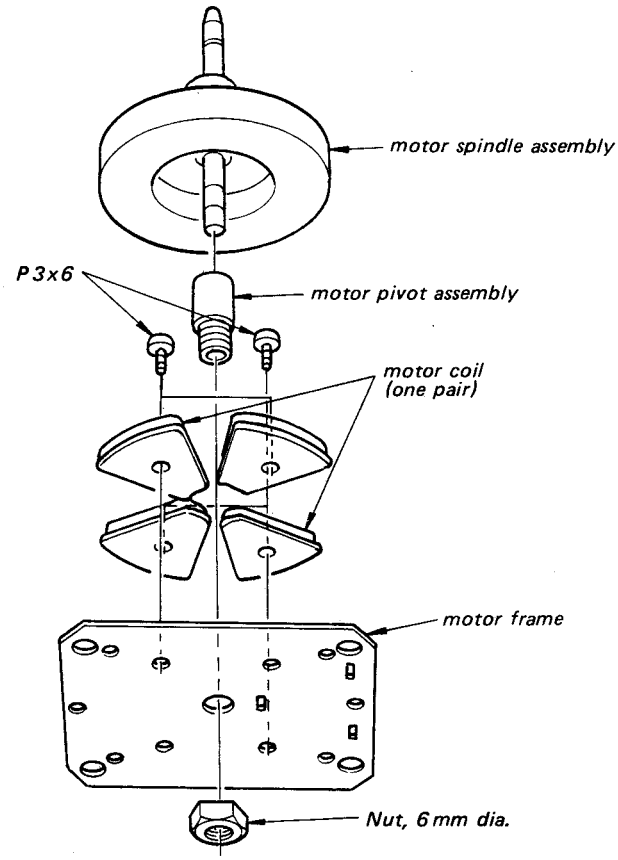


Fig. 5-1

1. When the motor shaft is replaced, apply two drops of the SONY oil (OL-2KA) on the tip of the pivot and apply grease to the parts marked by * in Fig. 5-2.

2. When the motor pivot assembly is replaced, apply two drops of the SONY oil (OL-2KA) in the pivot.

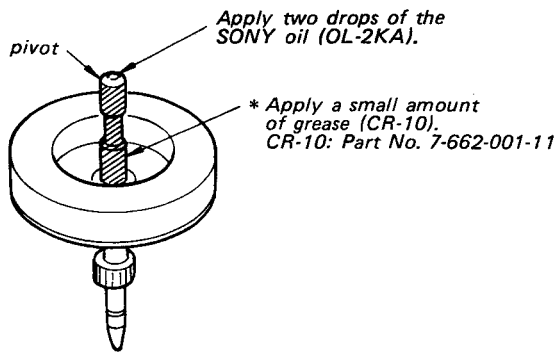


Fig. 5-2

– Continued on page 22 –

3. Insert the motor spindle assembly slowly in the motor pivot assembly so that the motor shaft is not disturbed by strong magnetic field strength.
4. The motor coils are composed of two pairs.
   a. Mount the coils on the motor frame so that the boss of the coil is placed in the hole of the frame as illustrated in Fig. 5-3.
   b. Push the coils in the arrowed direction and tighten the screws.
   c. Lay the leads of the coils as shown in Fig. 5-4 and fix the leads in the slot between the portions marked by * in Fig. 5-5.

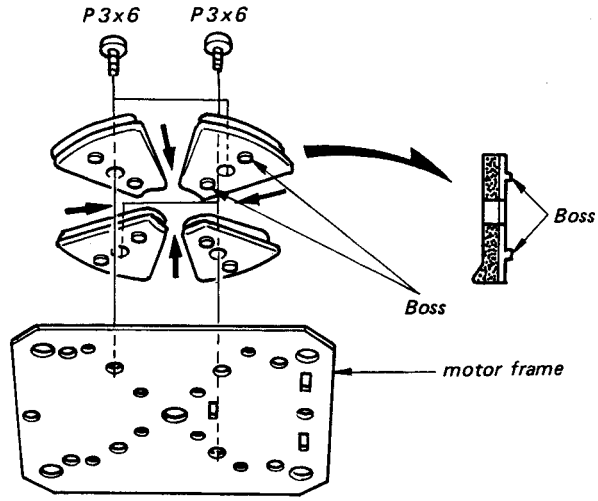


Fig. 5-3

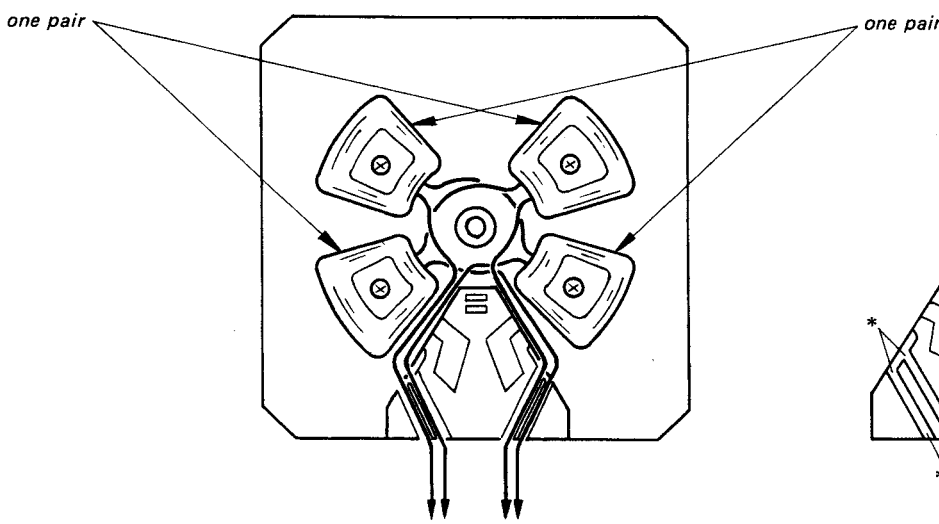


Fig. 5-4

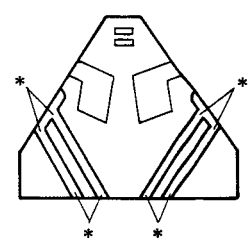


Fig. 5-5

SECTION 6
ADJUSTMENTS

6-1. MECHANICAL ADJUSTMENT

Stylus Drop-point Adjustment

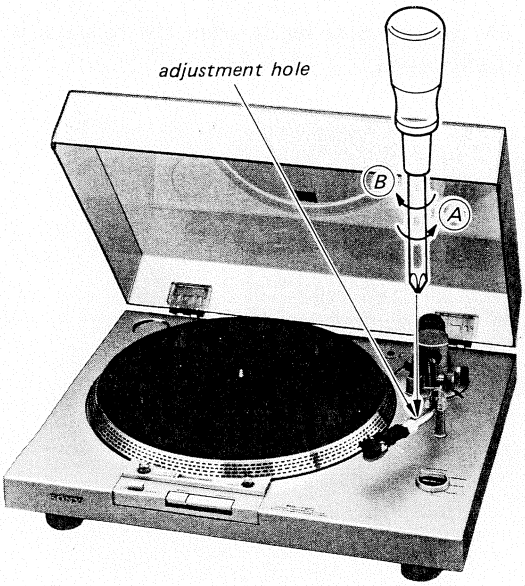


Fig. 6-1

1. Set the record size selector lever to the 30 (12″) position and make sure that the stylus gets down on the specified point of the test record.

   test record: YFSC-16

Record size selector lever position	Count of drop-point
30 (12″)	4 to 16
25 (10″)	6 to 24
17 (7″)	7 to 25

2. If necessary, insert the screwdriver into the hole and adjust the drop-point by turning the adjustment screw.

   To change the drop-point inward:
   Turn the adjustment screw slightly counterclockwise (A).

   To change the drop-point outward:
   Turn the adjustment screw slightly clockwise (B).

3. Once it is properly adjusted with a 30 cm (12″) record, the drop-point will be correct for 17 cm (7″) and 25 cm (10″) records as well.

   Note: The stylus drop-point is changed about 12 mm (½″) by one turn of the adjustment screw.

HEAD SHELL SLANT ADJUSTMENT

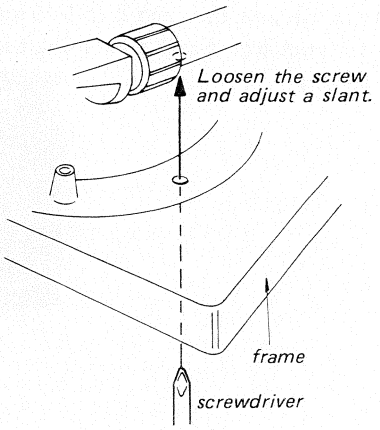
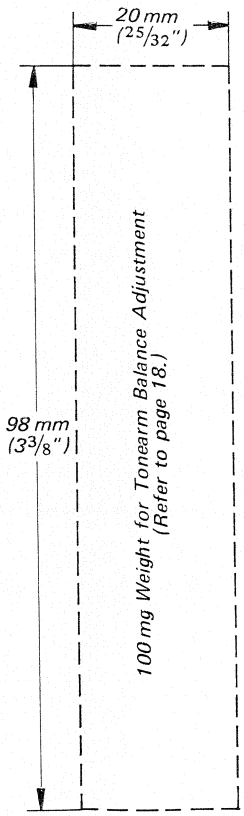


Fig. 6-2



TONEARM HEIGHT ADJUSTMENT

Automatic/Manual Return Operation

Adjust the height of the lifter assembly by loosening the set screw so that the clearance between the stylus tip and the record is 5–9 mm ($3/16$–$3/8$"), when the tonearm is raised by using the cueing lever after playing.

Check for the same result when the tonearm is automatically raised.

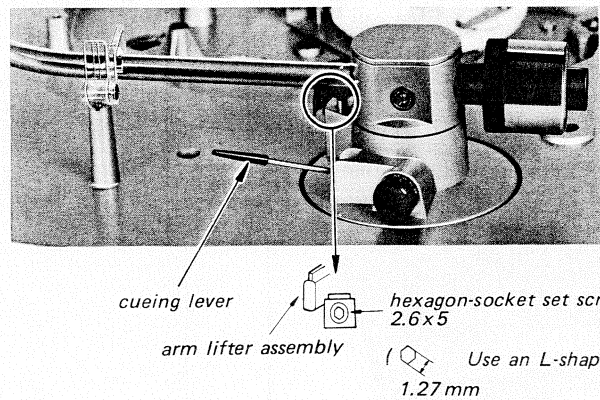


Fig. 6-3

AUTOMATIC RETURN POSITION ADJUSTMENT

1. Remove the turntable and the bottom board.
2. Reset: Move the clutch A and the clutch B in the arrowed direction as shown in Fig. 6-4B.
3. Adjust the position of the cartridge so that the stylus comes on the center of the boss as shown in Fig. 6-4A.
4. Turn the adjustment screw in Fig. 6-4D so that the portion shown by *1 of the center gear contacts the portion shown by *2 of the clutch A as shown in Fig. 6-4B.
5. Use the test record (A side C-3 of the Sony test record YFSC-16) and confirm that the tonearm automatically returns within 3–12 counts.

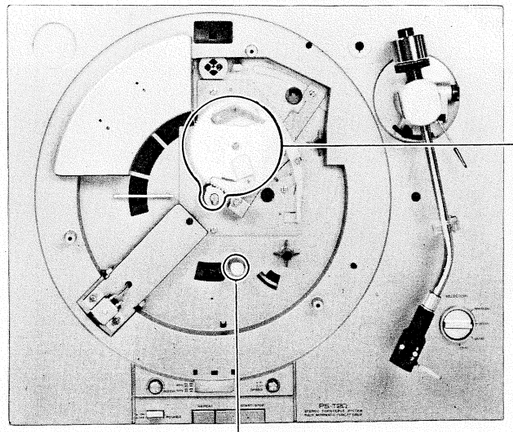


Fig. 6-4A

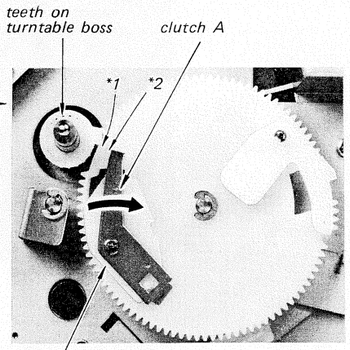


Fig. 6-4B

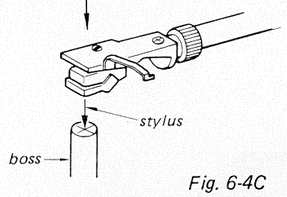


Fig. 6-4C

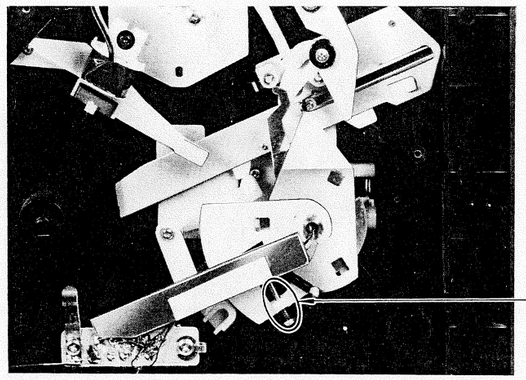


Fig. 6-4D

6-2. ELECTRICAL ADJUSTMENT

SPEED ADJUSTMENT

When the correct speed can not be obtained by the PITCH Control, adjust RV2/RV3 (Fig. 6-5) with a screwdriver until the respective stroboscope pattern appears stationary.

Note: Set the PITCH control to mechanical-mid position during the adjustment.

Holes for speed adjustment.

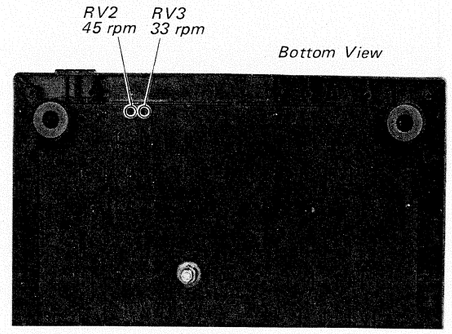


Fig. 6-5

GAIN ADJUSTMENT

1. Remove the turntable.
2. Unsolder the portion shown by Ⓐ and connect the regulated power supply as illustrated in Fig. 6-6.
3. Connect a VTVM between the emitter of Q6/Q8 and the ground.
4. Adjust RV4/RV5 so that the VTVM reading is 2.5 V ac.

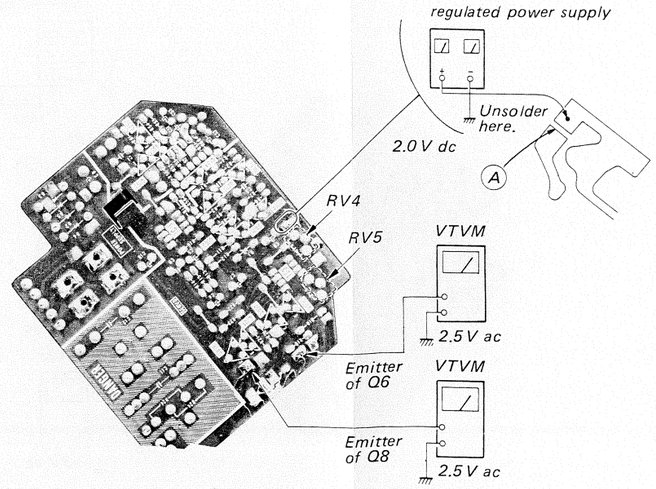


Fig. 6-6

6-2. ELECTRICAL ADJUSTMENT

SPEED ADJUSTMENT

When the correct speed can not be obtained by the PITCH Control, adjust RV2/RV3 (Fig. 6-5) with a screwdriver until the respective stroboscope pattern appears stationary.

Note: Set the PITCH control to mechanical-mid position during the adjustment.

Holes for speed adjustment.

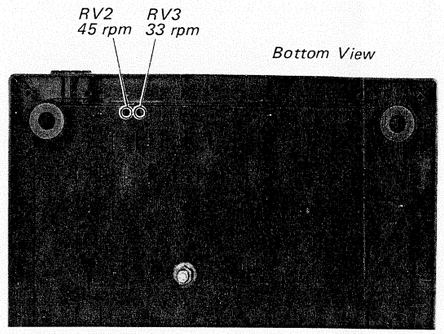


Fig. 6-5

GAIN ADJUSTMENT

1. Remove the turntable.
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3. Connect a VTVM between the emitter of Q6/Q8 and the ground.
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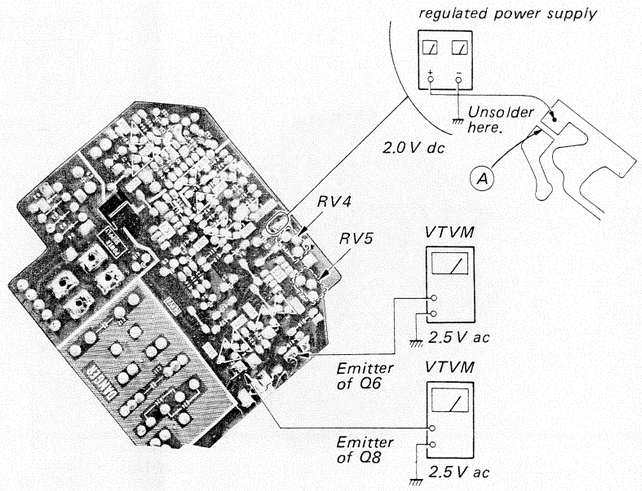
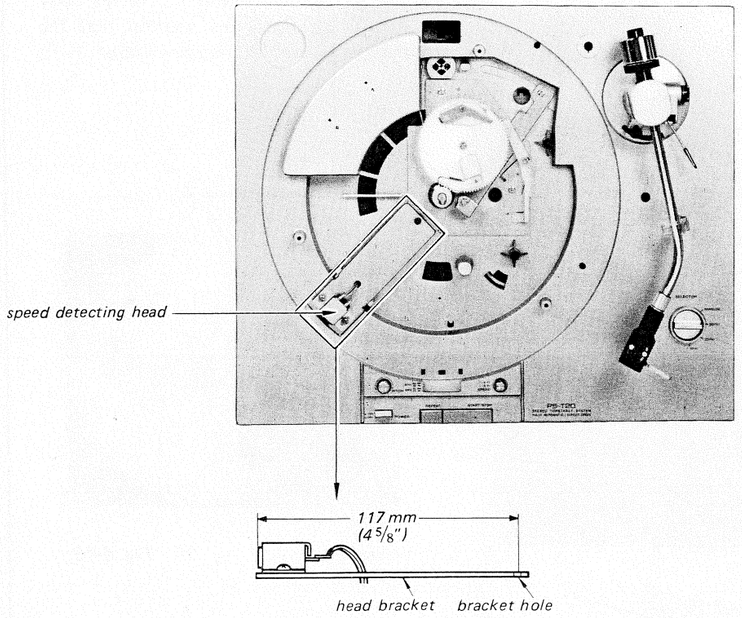
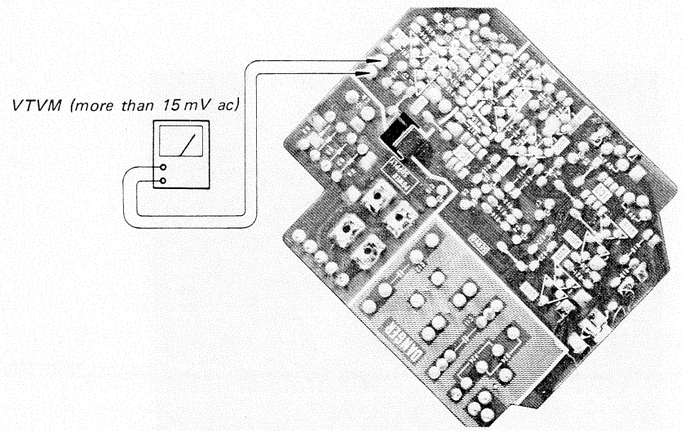


Fig. 6-6

SPEED DETECTING HEAD ADJUSTMENT

1. Fix the speed detecting head temporarily at a distance of 117 mm (4 5/8") from the bracket hole to the head tip.
2. Adjust the head position so that the output level of the head exceeds 15 mV ac (at 33 rpm) when the turntable is rotating.





SECTION 7
DIAGRAMS

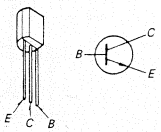
7-1. MOUNTING DIAGRAM

– Conductor Side –

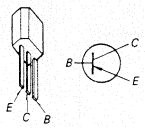
Replacement Semiconductors

For replacement, use semiconductors except in ( ).

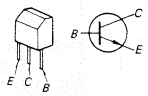
Q1–4
Q52–54 : 2SC1364



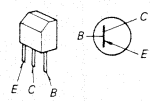
Q5, 51: 2SA678



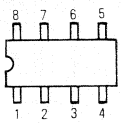
Q6, 8: 2SD571



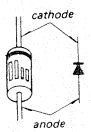
Q7, 9: 2SB605



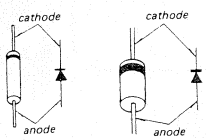
IC1, 2: μPC4558C



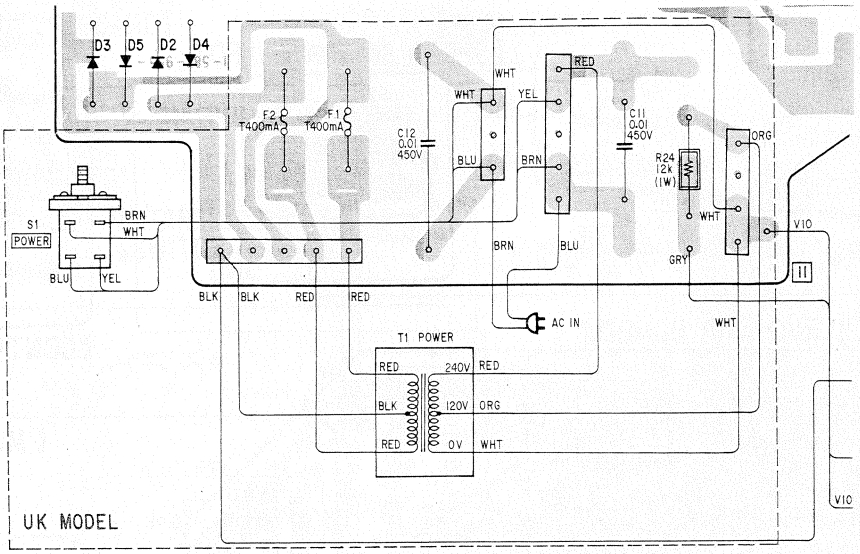
D1: EQB01-05 (EQA01-05R)

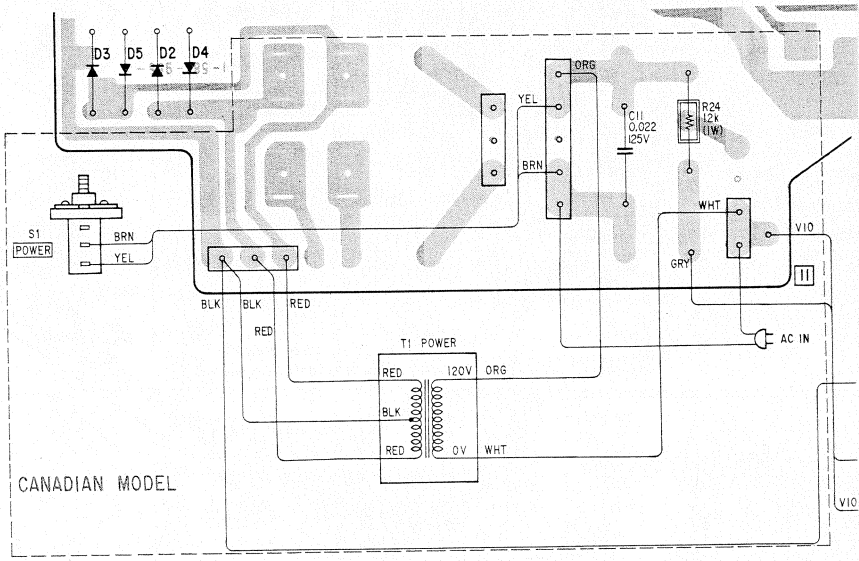


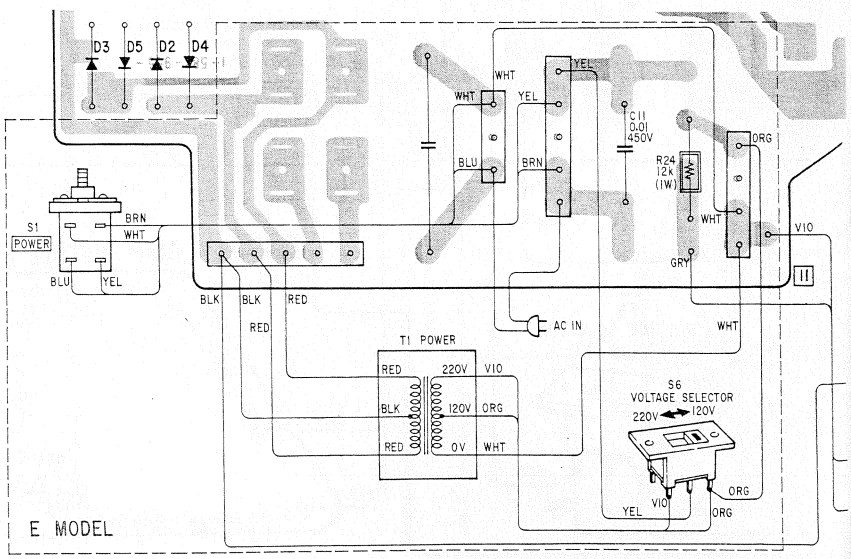
D2–5: 10E-2 (GP08D)

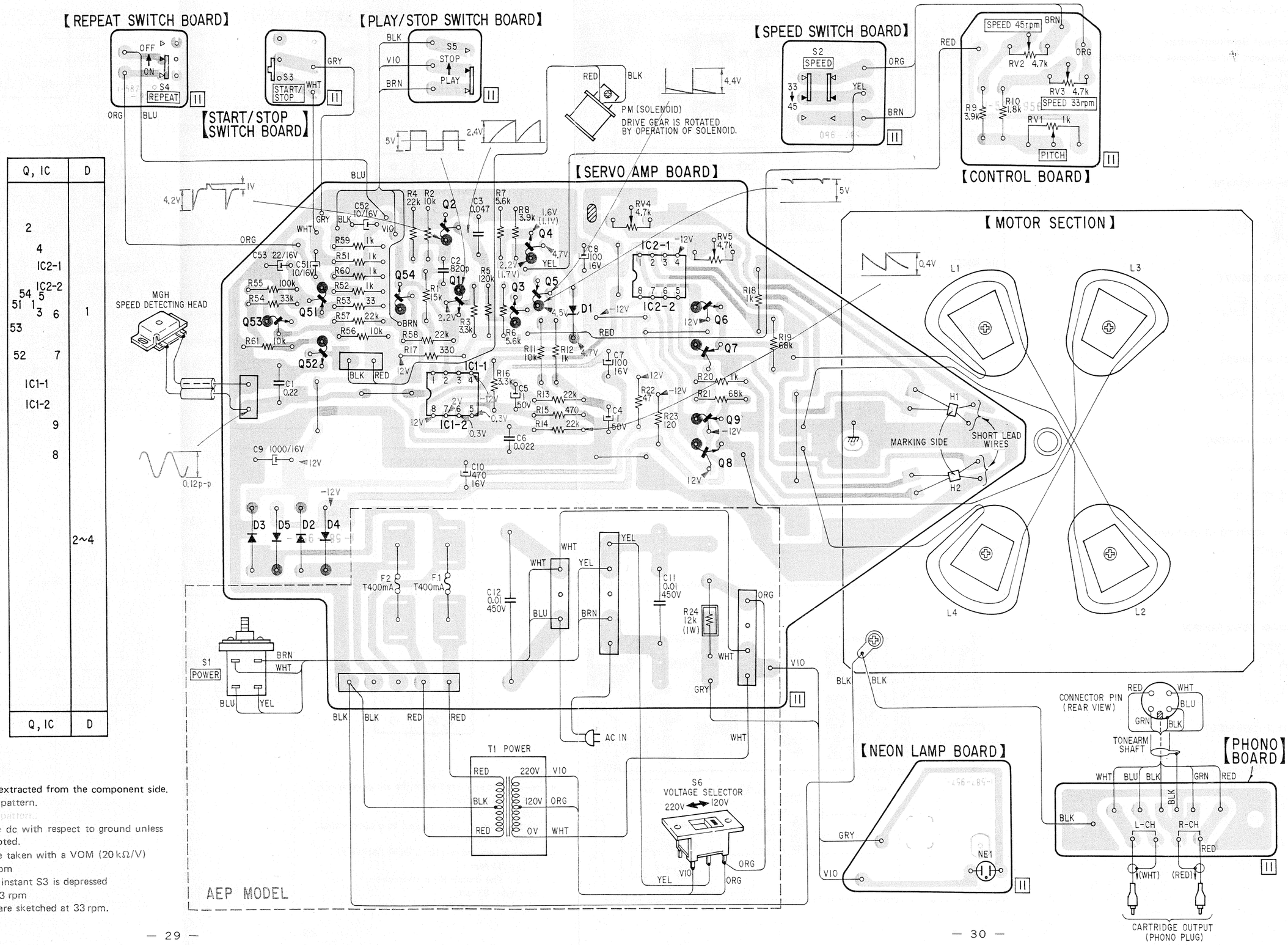


H1, 2: 5GF-MS-07F





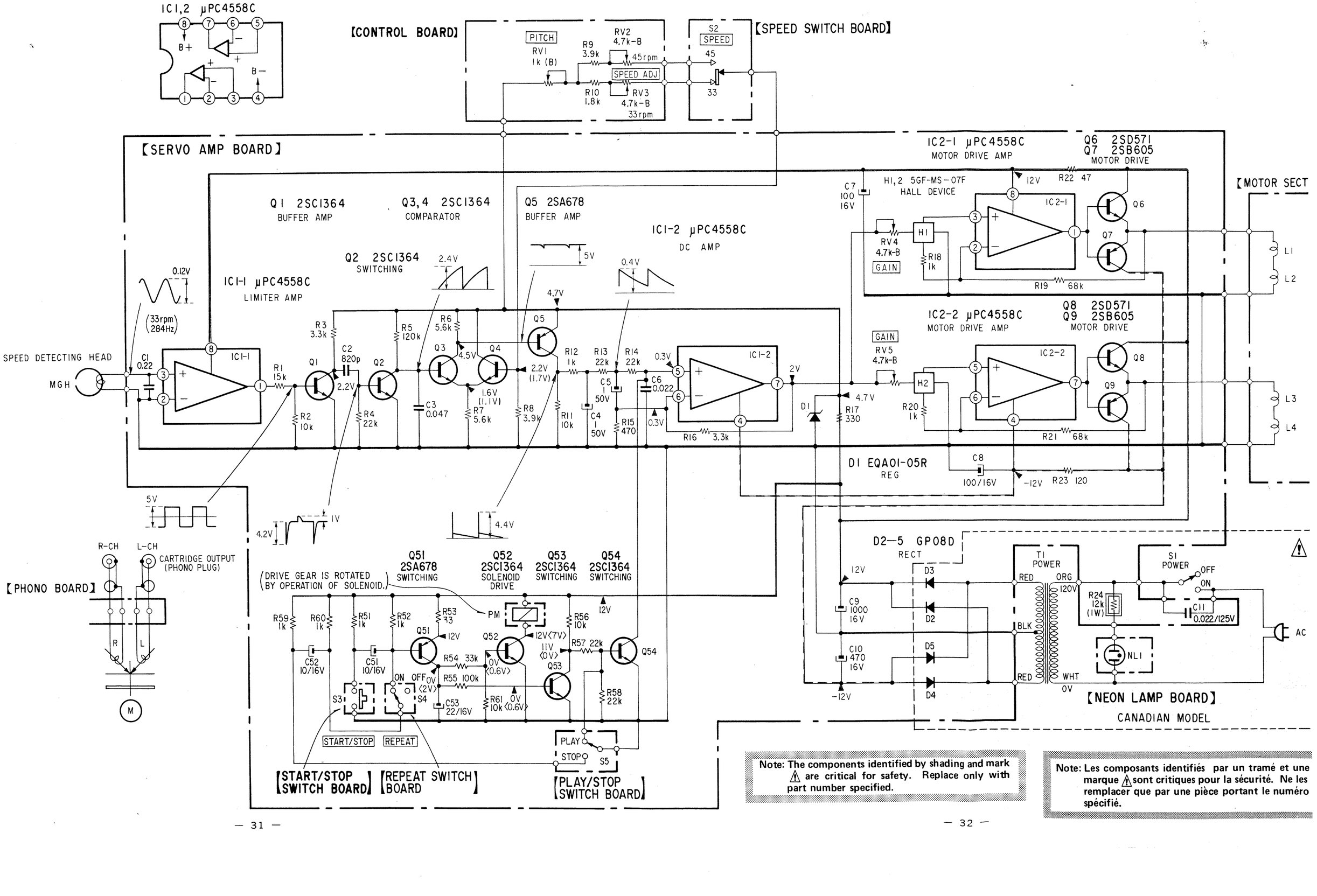




Note:

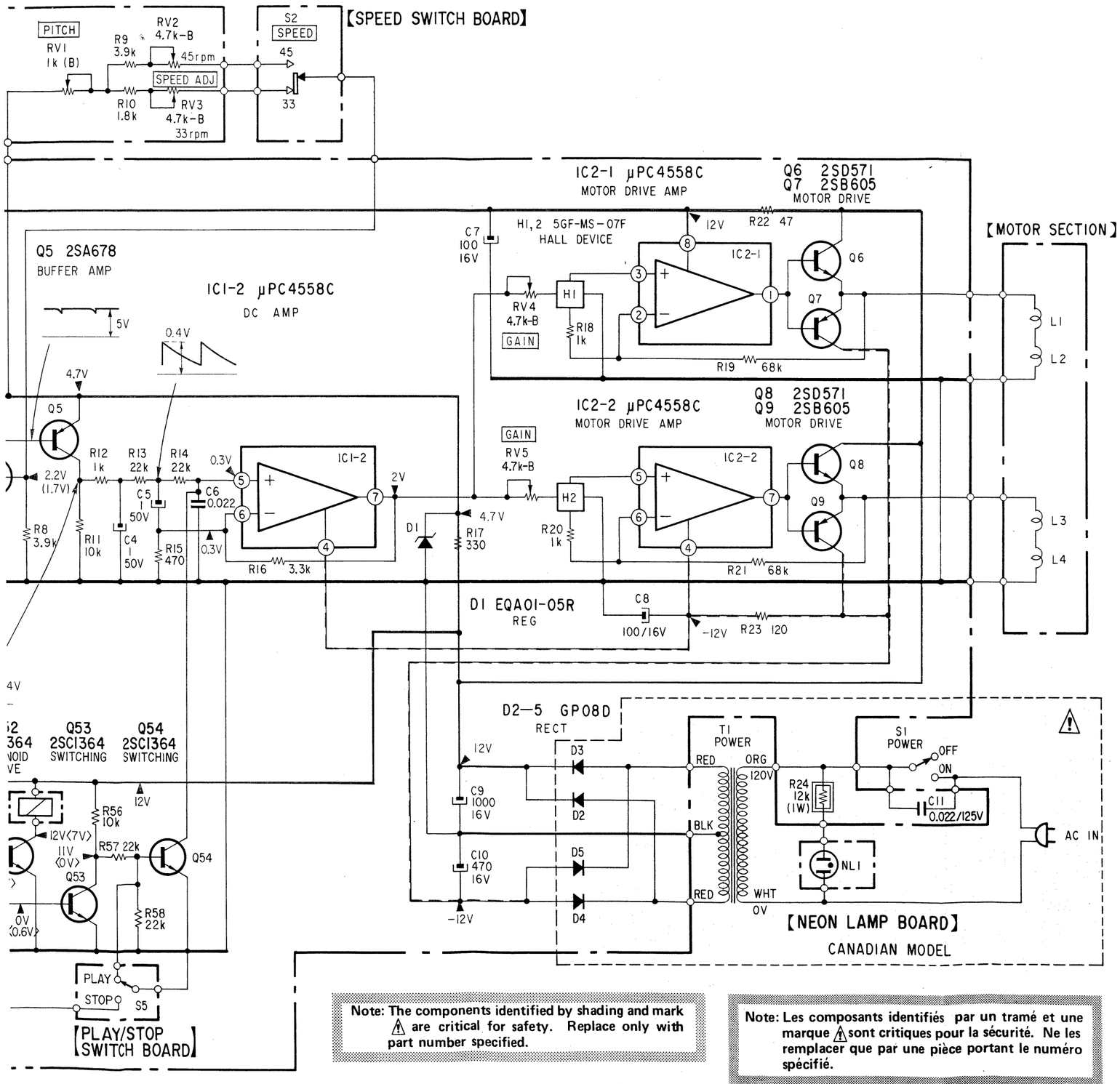
- ○—: parts extracted from the component side.
- : B+ pattern.
- : B- pattern.
- Voltages are dc with respect to ground unless otherwise noted.
- Readings are taken with a VOM (20 kΩ/V)
  ( ): 45 rpm
  〈 〉: The instant S3 is depressed
  no mark: 33 rpm
- Waveforms are sketched at 33 rpm.

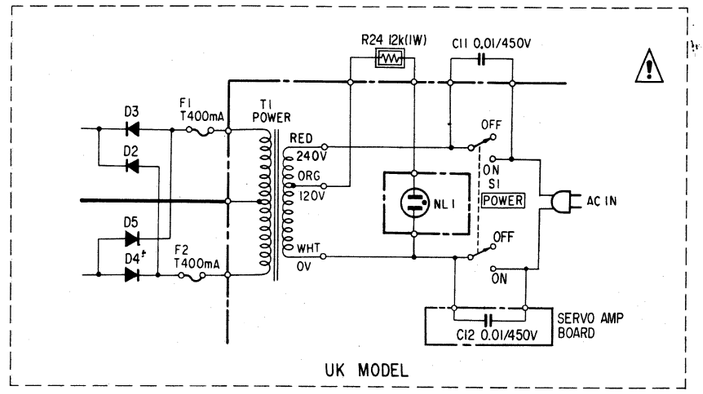
7-2. SCHEMATIC DIAGRAM

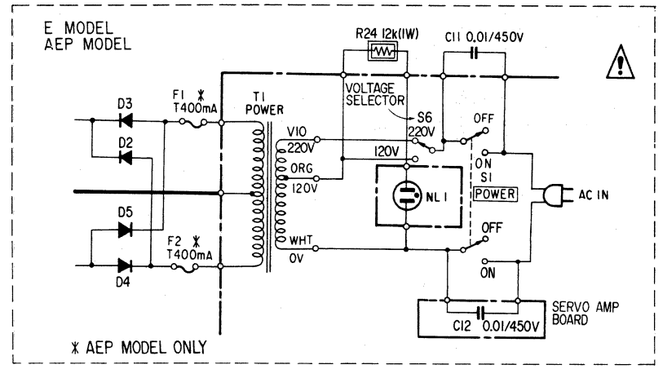


Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note: Les composants identifiés par un tramé et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.







Note:

- All capacitors are in μF unless otherwise noted. pF: μμF 50WV or less are not indicated except for electrolytics.
- All resistors are in ohms, ¼W unless otherwise noted. kΩ: 1000Ω; MΩ: 1000kΩ
- ▭ : nonflammable resistor.
- Voltages are dc with respect to ground unless otherwise noted.
- Readings are taken with a VOM (20kΩ/V).
  ( ): 45 rpm
  〈 〉: The instant S3 is depressed
  no mark: 33 rpm
- Voltage variations may be noted due to normal production tolerances.
- Waveforms are sketched at 33rpm.
- ▭ : panel designation.
- ▭ : adjustment for repair.
- ——: B+ bus.
- – – –: B- bus.
- Switch

Ref. No.	Switch	Position
S1	POWER	OFF
S2	SPEED	33
S3	START/STOP	OFF
S4	REPEAT	ON
S5	PLAY/STOP	PLAY
S6	VOLTAGE SELECTOR (AEP, E model)	220V

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

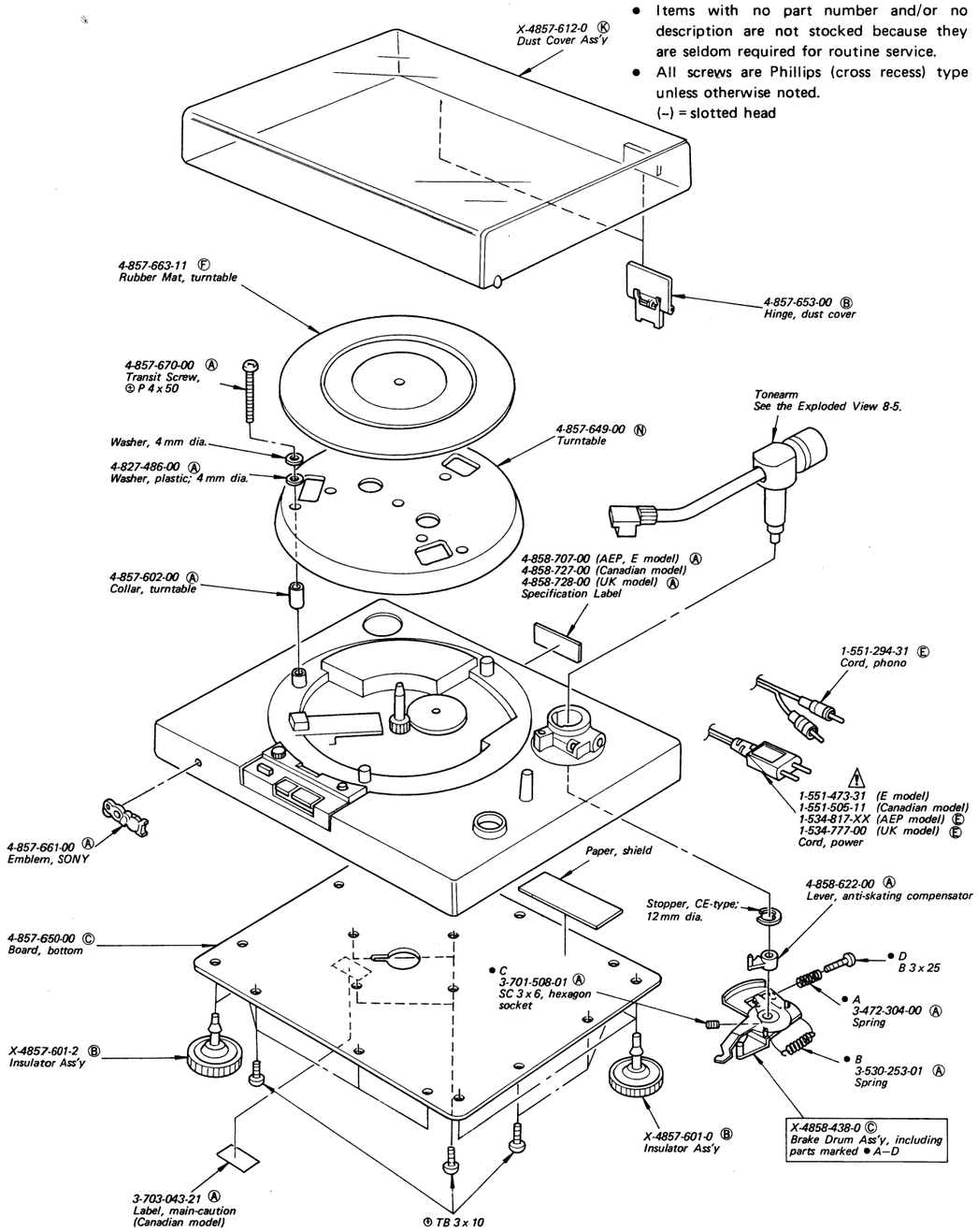
Note: Les composants identifiés par un tramé et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

SECTION 8
EXPLODED VIEWS

- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

8-1.

Note:
- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
(–) = slotted head



Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

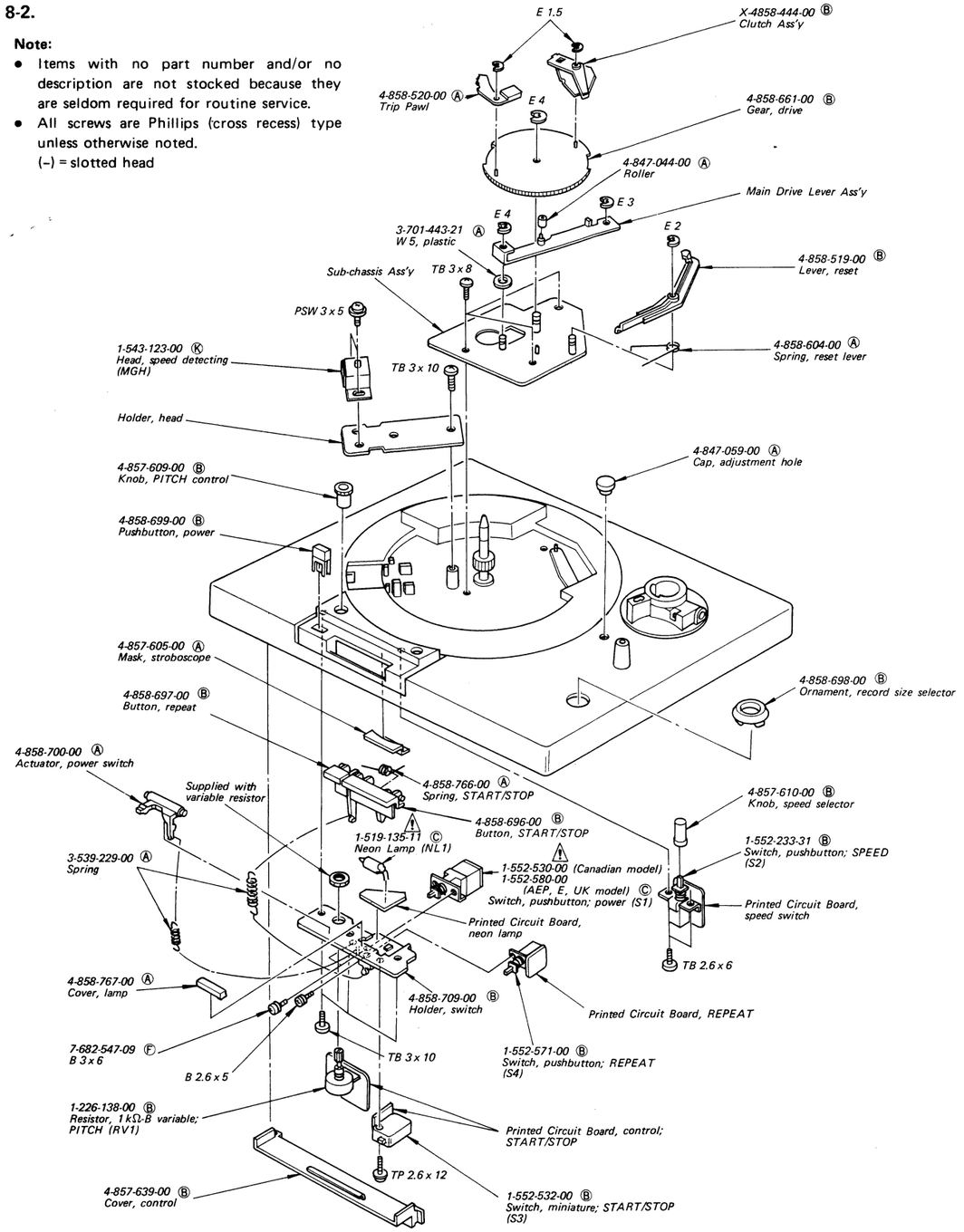
Note: Les composants identifiés par un tramé et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

PS-T20

- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

8-2.

Note:
- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
(–) = slotted head



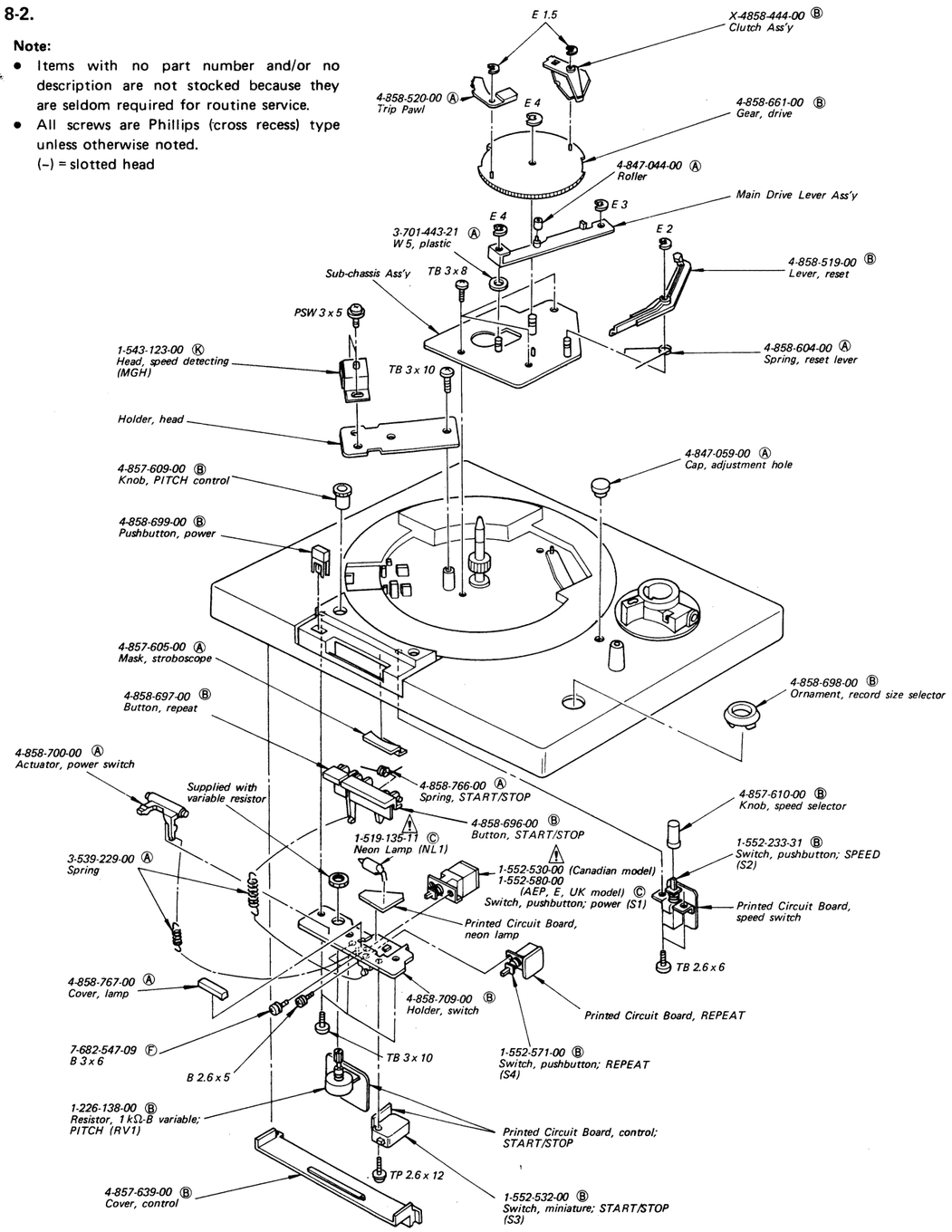
Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note: Les composants identifiés par un tramé et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

8-2.

Note:
- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
(–) = slotted head


E 1.5
X-4858-444-00 Ⓑ Clutch Ass'y
4-858-520-00 Ⓐ Trip Pawl
E 4
4-858-661-00 Ⓑ Gear, drive
4-847-044-00 Ⓐ Roller
Main Drive Lever Ass'y
E 3
E 4
E 2
3-701-443-21 Ⓐ W 5, plastic
TB 3 x 8
Sub-chassis Ass'y
4-858-519-00 Ⓑ Lever, reset
PSW 3 x 5
4-858-604-00 Ⓐ Spring, reset lever
1-543-123-00 Ⓚ Head, speed detecting (MGH)
TB 3 x 10
Holder, head
4-847-059-00 Ⓐ Cap, adjustment hole
4-857-609-00 Ⓑ Knob, PITCH control
4-858-699-00 Ⓑ Pushbutton, power
4-858-698-00 Ⓑ Ornament, record size selector
4-857-605-00 Ⓐ Mask, stroboscope
4-858-697-00 Ⓑ Button, repeat
4-858-700-00 Ⓐ Actuator, power switch
Supplied with variable resistor
4-858-766-00 Ⓐ Spring, START/STOP
4-858-696-00 Ⓑ Button, START/STOP
4-857-610-00 Ⓑ Knob, speed selector
1-519-135-11 Ⓒ Neon Lamp (NL1)
1-552-530-00 (Canadian model)
1-552-580-00 (AEP, E, UK model) Ⓒ Switch, pushbutton; power (S1)
1-552-233-31 Ⓑ Switch, pushbutton; SPEED (S2)
3-539-229-00 Ⓐ Spring
Printed Circuit Board, neon lamp
Printed Circuit Board, speed switch
TB 2.6 x 6
4-858-767-00 Ⓐ Cover, lamp
4-858-709-00 Ⓑ Holder, switch
Printed Circuit Board, REPEAT
7-682-547-09 Ⓕ B 3 x 6
B 2.6 x 5
TB 3 x 10
1-552-571-00 Ⓑ Switch, pushbutton; REPEAT (S4)
1-226-138-00 Ⓑ Resistor, 1 kΩ-B variable; PITCH (RV1)
Printed Circuit Board, control; START/STOP
TP 2.6 x 12
4-857-639-00 Ⓑ Cover, control
1-552-532-00 Ⓑ Switch, miniature; START/STOP (S3)

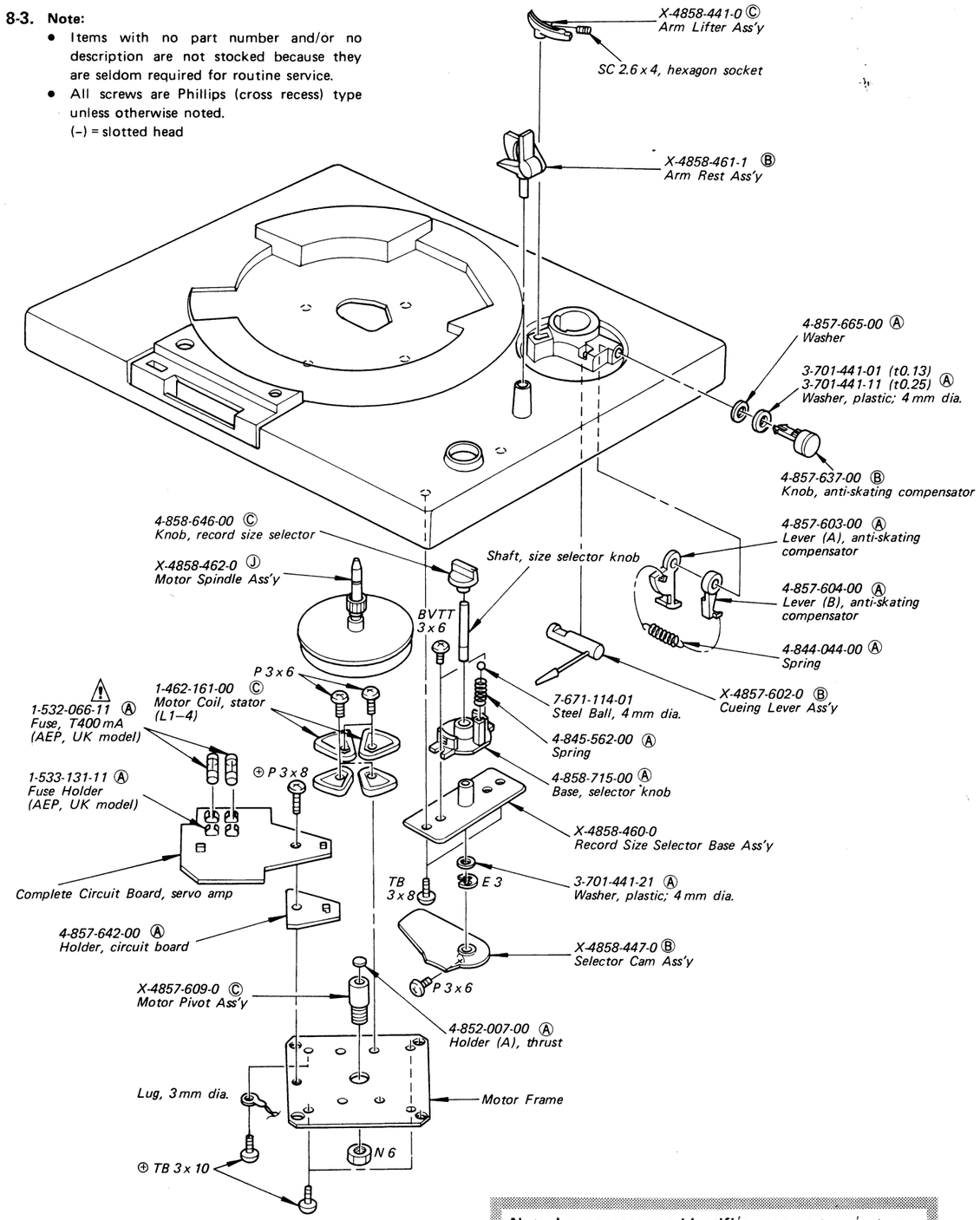
Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note: Les composants identifiés par un tramé et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

8-3.

Note:
- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
(–) = slotted head


X-4858-441-0 Ⓒ Arm Lifter Ass'y
SC 2.6 x 4, hexagon socket
X-4858-461-1 Ⓑ Arm Rest Ass'y
4-857-665-00 Ⓐ Washer
3-701-441-01 (t0.13) Ⓐ
3-701-441-11 (t0.25) Ⓐ Washer, plastic; 4 mm dia.
4-857-637-00 Ⓑ Knob, anti-skating compensator
4-858-646-00 Ⓒ Knob, record size selector
4-857-603-00 Ⓐ Lever (A), anti-skating compensator
X-4858-462-0 Ⓙ Motor Spindle Ass'y
Shaft, size selector knob
4-857-604-00 Ⓐ Lever (B), anti-skating compensator
BVTT 3 x 6
4-844-044-00 Ⓐ Spring
P 3 x 6
X-4857-602-0 Ⓑ Cueing Lever Ass'y
1-462-161-00 Ⓒ Motor Coil, stator (L1–4)
7-671-114-01 Steel Ball, 4 mm dia.
⚠ 1-532-066-11 Ⓐ Fuse, T400 mA (AEP, UK model)
4-845-562-00 Ⓐ Spring
⊕ P 3 x 8
1-533-131-11 Ⓐ Fuse Holder (AEP, UK model)
4-858-715-00 Ⓐ Base, selector knob
X-4858-460-0 Record Size Selector Base Ass'y
Complete Circuit Board, servo amp
TB 3 x 8
E 3
3-701-441-21 Ⓐ Washer, plastic; 4 mm dia.
4-857-642-00 Ⓐ Holder, circuit board
X-4858-447-0 Ⓑ Selector Cam Ass'y
P 3 x 6
X-4857-609-0 Ⓒ Motor Pivot Ass'y
4-852-007-00 Ⓐ Holder (A), thrust
Lug, 3 mm dia.
Motor Frame
N 6
⊕ TB 3 x 10

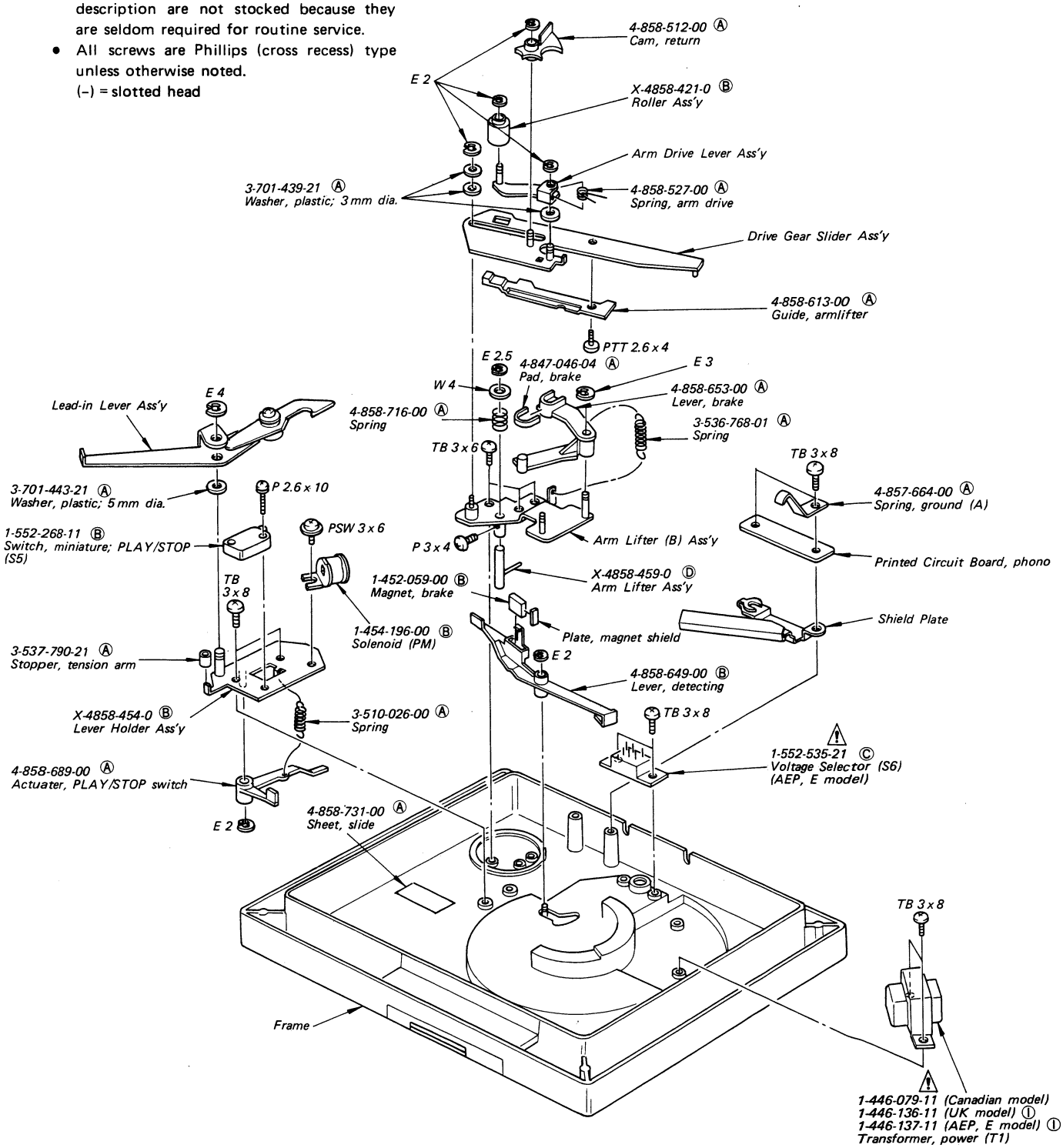
Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note: Les composants identifiés par un tramé et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

A	B	C	D

8-4. Note:

- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (-) = slotted head



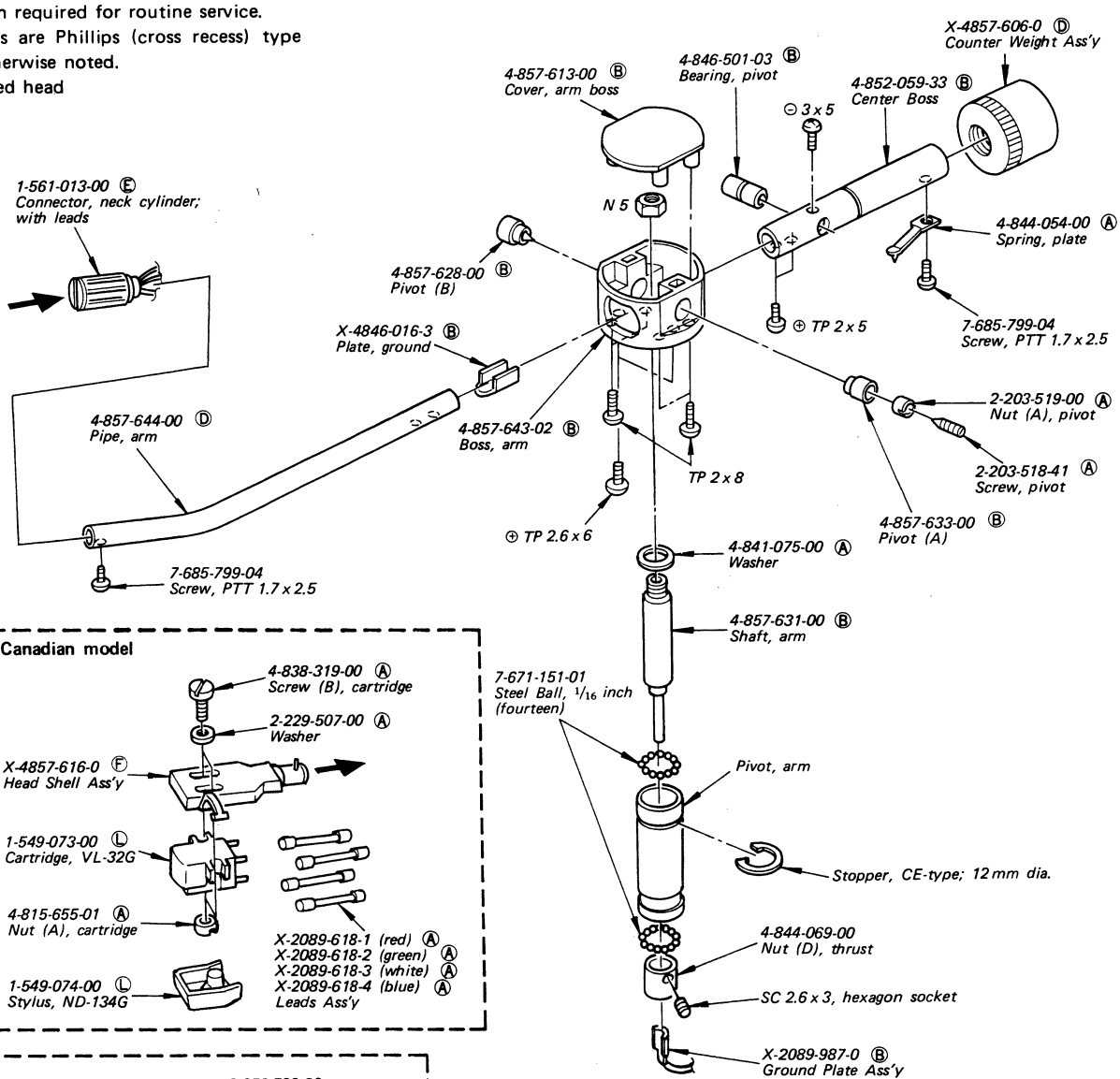
Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

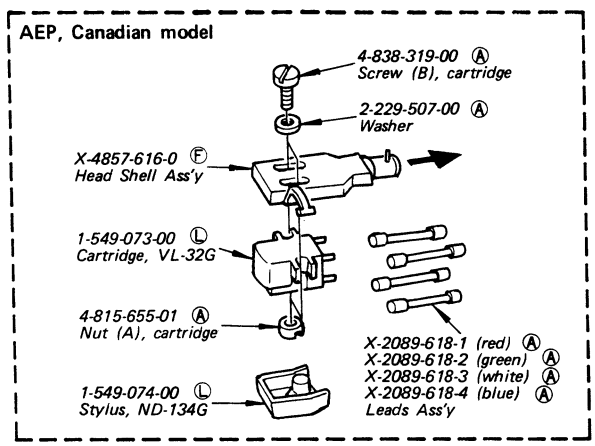
Note: Les composants identifiés par un tramé et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

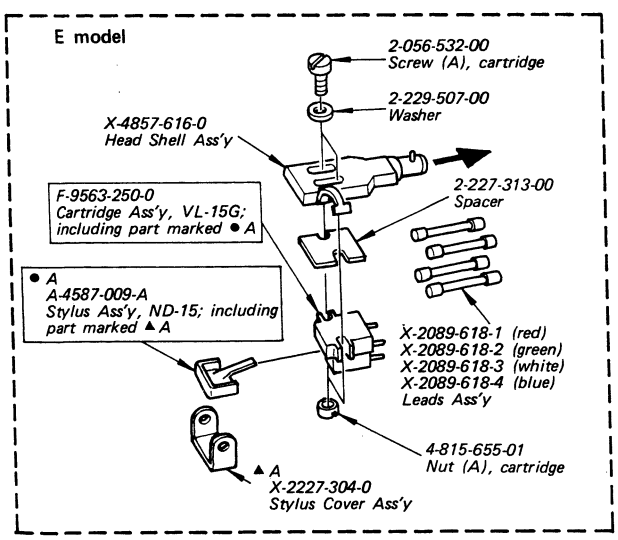
8-5. Note:

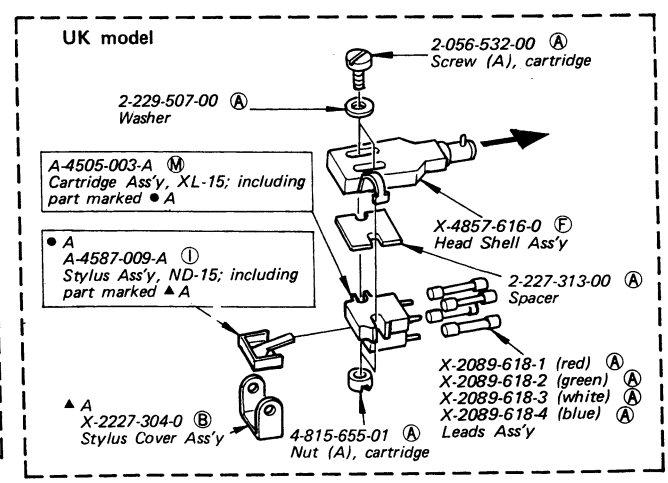
- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.

(-) = slotted head









SECTION 9
ELECTRICAL PARTS LIST

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

Ref. No.	Part No.		Description
			SEMICONDUCTORS
			Transistors
Q1–4	8-729-663-47	Ⓑ	2SC1364
Q5	8-727-788-00	Ⓑ	2SA678
Q6	8-729-157-11	Ⓑ	2SD571
Q7	8-729-160-51	Ⓑ	2SB605
Q8	8-729-157-11	Ⓑ	2SD571
Q9	8-729-160-51	Ⓑ	2SB605
Q51	8-727-788-00	Ⓑ	2SA678
Q52–54	8-729-663-47	Ⓑ	2SC1364
			ICs
IC1,2	8-759-145-58	Ⓓ	μPC4558C
			Diodes
⇒D1	8-719-931-05	Ⓑ	EQB01-05
⇒D2–5	⚠8-719-200-02	Ⓑ	10E2
			Hall Elements
H1,2	8-719-905-07	Ⓒ	5GF-MS-07F
			COILS
L1–4	1-462-161-00	Ⓒ	Motor Coil, stator
			TRANSFORMERS
T1	⚠1-446-079-11		Power (Canadian model)
T1	⚠1-446-136-11	Ⓘ	Power (UK model)
T1	⚠1-446-137-11	Ⓘ	Power (E, AEP model)
			CAPACITORS
	All capacitors are in μF. 50WV or less are not indicated except for electrolytics. pF = μμF, elect = electrolytic		
C1	1-108-293-12	Ⓑ	0.22 mylar
C2	1-102-117-11	Ⓐ	820p ceramic
C3	1-108-812-12	Ⓐ	0.047 mylar
C4,5	1-121-391-11	Ⓐ	1 50V elect
C6	1-161-034-11	Ⓐ	0.022 ceramic
C7,8	1-123-193-11	Ⓐ	100 16V elect
C9	1-121-944-11	Ⓑ	1000 16V elect
C10	1-121-939-11	Ⓑ	470 16V elect
C11	⚠1-130-098-12		0.022 125V film (Canadian model)
C11,12	⚠1-115-148-11	Ⓒ	0.01 450V paper (AEP, E, UK model)
C51,52	1-121-651-11	Ⓐ	10 16V elect
C53	1-121-479-11	Ⓐ	22 16V elect
			RESISTORS
	All resistors are in ohms. Common ¼W carbon resistors are omitted. Check schematic diagram for their values.		
R24	⚠1-213-156-11	Ⓐ	12k 1W metal oxide (nonflammable)
RV1	1-226-138-00	Ⓑ	1 k-B, variable; PITCH
RV2–5	1-224-633-00	Ⓑ	4.7 k-B, adjustable
			SWITCHES
S1	⚠1-552-530-00		Pushbutton, POWER (Canadian model)
S1	⚠1-552-580-00	Ⓒ	Pushbutton, POWER (AEP, E, UK model)
S2	1-552-233-31	Ⓑ	Pushbutton, SPEED 33/45 rpm
S3	1-552-532-00	Ⓑ	Miniature, START/STOP
S4	1-552-571-00	Ⓑ	Pushbutton, REPEAT
S5	1-552-268-11	Ⓑ	Miniature, PLAY/STOP
S6	⚠1-552-535-21	Ⓒ	Voltage Selector (E, AEP model)

⇒: Due to standardization, interchangeable replacements may be substituted for parts specified in the diagrams.

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note: Les composants identifiés par un tramé et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

Ref. No.	*Part No.*	*Description*
		MISCELLANEOUS
F1,2	⚠ 1-532-066-11	Ⓑ Fuse, T400 mA (AEP, UK model)
MGH	1-543-123-00	Ⓚ Head, speed detecting (MGH)
NL1	⚠ 1-519-135-11	Ⓑ Neon Lamp
PM	1-454-196-00	Ⓑ Solenoid, drive gear
	1-452-059-00	Ⓑ Magnet, brake
	A-4505-003-A	Ⓣ Cartridge Ass'y, w/stylus; XL-15 (UK model)
	A-4587-009-A	Ⓝ Stylus Ass'y, ND-15G (UK, E model)
	F-9563-250-0	Cartridge Ass'y, w/stylus; VL-15G (E model)
	⚠ 1-533-131-11	Ⓐ Holder, fuse (AEP, UK model)
	⚠ 1-534-777-00	Ⓔ Cord, power (UK model)
	⚠ 1-534-817-XX	Ⓔ Cord, power (AEP model)
	1-549-073-00	Ⓛ Cartridge, VL-32G (AEP, Canadian model)
	1-549-074-00	Ⓛ Stylus, ND-134G (AEP, Canadian model)
	1-551-294-31	Ⓓ Cord, phono
	⚠ 1-551-473-31	Cord, power (E model)
	⚠ 1-551-505-11	Cord, power (Canadian model)
	1-561-013-11	Ⓔ Connector, neck cylinder; with leads

ACCESSORIES & PACKING MATERIALS

Part No.	*Description*
3-701-613-00	Ⓐ Bag, plastic; instruction manual
3-701-616-00	Ⓐ Bag, plastic; counterweight, head shell
3-701-632-00	Ⓐ Bag, plastic; turntable spacer
3-701-806-00	Ⓐ 45 rpm Adaptor
3-770-590-11	Ⓓ Instruction Manual (AEP, E, UK model)
3-794-263-11	Ⓐ Notice (AEP model)
3-794-295-11	Notice (E model)
3-794-265-11	Ⓐ Notice (UK model)
3-770-590-21	Instruction Manual
3-794-291-31	Instruction Manual, French (Canadian model)
3-794-263-11	Notice (Canadian model)
4-848-002-00	Ⓐ Cushion, arm pipe
4-857-655-00	Ⓐ Plate (A), protection
4-857-656-00	Ⓐ Plate (B), protection
4-857-657-00	Ⓑ Bag, protection
4-857-658-00	Ⓐ Spacer, turntable
4-857-659-00	Ⓑ Cushion, right
4-857-660-00	Ⓑ Cushion, left
4-858-407-00	Ⓐ Drop-point Adjustment Key
4-858-736-00	Ⓓ Carton

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note: Les composants identifiés par un tramé et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.